



# 2<sup>nd</sup> INTERNATIONAL FOOD CHEMISTRY CONGRESS

16-19 MARCH 2023

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## ABSTRACT BOOK

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Dear Colleagues,

We aim to create a healthy bridge between the relevant sectors, Turkish and world scientists and public authorities by organizing sustainable congresses for many years together with the Turkish Chemists Society, and to contribute to the production and production of value-added and reliable products for our country. World. While doing this, our main goal has been to create synergy and discussion opportunities by researching and communicating multidisciplinary working ways with chemistry and related majors and stakeholders needed in almost every sector related to production.

Although Türkiye has great opportunities in food production from seed to plate, the full and efficient use of this potential necessitates a total cooperation. As seen in the grain corridor crisis that emerged due to the war in 2022, this is an issue that should be followed with a common mind not only for Türkiye but also for our world.

For this reason, the Republic of Türkiye, the Ministry of Agriculture and Forestry, Universities and distinguished institutes from Türkiye and the world - Chemistry, Biology, Food Engineering and Chemical Engineering Departments, Agricultural Engineering, Veterinary Faculties, Health Sciences Faculties, Nutrition and Dietetics Departments, Pharmacy Faculties - We aimed to bring together representatives of the private sector operating in the field of food chemistry and technology, public and private sector officials working in the field of quality control and standardization, halal food, and all stakeholders who can contribute to sustainability.

In this context, the 2nd International Food Chemistry Congress was held as an “international” scientific meeting with the support of the Turkish Chemists Society, Gebze Technical University and the Ministry of Agriculture and Forestry of the Republic of Türkiye, at Antalya Mirage Park Resort between 16 – 19 March 2023.

I would like to thank all our speakers who supported us in the scientific program, achieved international success and visited our country for this congress. In addition to the intensive scientific presentations in the program, we were very happy to establish an important bridge between the University, industry and the public with two workshops organized by our Ministry of Agriculture and Forestry. In addition, the workshops prepared by our companies have made very important contributions to the sector. It is hopeful for our world that our young researchers have the opportunity to present their posters with short oral presentations and the excitement we see in them. Posters were presented for a total of six hours over three days, providing a suitable platform for broad discussion.

The congress summary booklet was published in the special issue of the Congress of Agricultural and Food Chemistry Records and separate doi assignments were made for each abstract. As such, the metadata of your presentations have permanently taken their place in the world literature. I would like to take this opportunity to express my gratitude to our congress scientific committee, editing committee and ACG PUBLICATIONS publication team.

Authors can submit their studies in full text by registering on the ACG PUBLICATIONS website, along with the stickers and congress participation certificates given by the editorial board to send the studies to the Journal of Agri-Food Chemistry and Chemical Metrology during the congress, to use the template files of the relevant journal and to comply with the spelling rules. Applications that are successful in the peer-review stage will be published in these journals free of charge in accordance with their purpose and scope, and the APC payments of these studies will be made by Troyasil HPLC Column Technologies. I would like to thank Troyasil HPLC technologies for their support.

We are very happy to see that all our brothers and sisters in the world are with us in the great

earthquake disaster we experienced at the beginning of 2023.

We would be very happy if you would share your experiences here with your angels when you return to your countries. We hope to see you and our new guests with more presentations at the 3rd International Food Chemistry Congress next year in order to develop new collaborations and joint projects.

Sincerely Yours,

Prof. Dr. Ahmet Ceyhan Goren  
Chair  
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Prof.Dr. Mehmet Öztürk  
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## KP-01 Sterol Enriched Functional Beverages and Cardiovascular Health

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Non-communicable diseases (NCD) have been on the rise, representing 60% of all deaths in the world. Cardiovascular diseases (CVD), one of the NCD, are the leading cause of death globally, taking an estimated 17.9 million lives each year. Due to cholesterol lowering effect, sterols are considered to be effective in the prevention of CVD. Tea is one of the most popular beverages consumed worldwide and is ranked at a level of being the second non-alcoholic drink after water. It is, therefore, of great importance to develop sterol-enriched functional beverage that helps prevention of CVD. We developed a sterol-enriched functional black tea (functional ice tea). A randomized, double-blind, placebo-controlled human clinical trial was conducted on volunteer subjects ( $n = 90$ ) aged 25-60 year with mild hypercholesterolemia. Subjects were randomly divided into placebo ( $n = 33$ ; M/F ratio 23/10), instant black tea ( $n = 34$ ; M/F ratio 25/9), and functional black tea (2 g sterols/day) ( $n = 32$ ; M/F ratio 24/8) groups and intervention period was conducted for 4 weeks. Compared with baseline, consumption of functional black tea significantly decreased the concentrations of total cholesterol by 5.6% ( $P < 0.001$ ), low-density lipoprotein cholesterol by 8.7% ( $P < 0.001$ ), apolipoprotein B ( $P < 0.05$ ), and oxidative stress index ( $P < 0.05$ ), while increasing the concentrations of adiponectin, total antioxidant status, and tissue-plasminogen activator ( $P < 0.05$ ). Functional black tea was superior to instant black tea in terms of cardiovascular risk biomarkers. The data indicate that consumption of newly developed product is an excellent beverage for delivering sterols and has several beneficial cardio-protective effects in subjects with mild hypercholesterolemia. Health claims on sterols and sterol enriched beverages in the market will also be presented.

**Keywords:** Cardiovascular health; functional foods.

## KP-02 The Role of the Immune System in the Prevention and Treatment of Viral Infections and Cancer, Plants and Bee Products that Strengthen the Immune System

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Our body is equipped with a defense system against external pathogens as well as malignancies such as cancerous cells formed in our body. When stimulated by disease-causing pathogens, the immune system is activated<sup>1</sup>. The immune system is broadly divided into innate and acquired immunity. While our innate immune system is an immunity determined by our genetic characteristics in intrauterine life, the acquired immune system is the immunity that is acquired through infection or vaccination<sup>2</sup>. Despite its lack of specificity, natural killer (NK) cells are the basic cells of the innate immune system and, they constitute a highly effective defense that can target virus-infected cells or cancerous cells to kill them. Therefore, the most effective method to prevent diseases is to strengthen the natural immune system<sup>3</sup>. In addition to regular sleep, stress-free life, regular sports and healthy nutrition to strengthen the innate immune system, medicinal plants such as black cumin (*Nigella sativa*), licorice root (*Glycyrrhiza glabra*), olive leaf (*Olea europaea L. folium*), garlic (*Allium sativum*), citrus fruits and bee products such as honey and propolis play an important role<sup>4</sup>. In this presentation, products that strengthen our natural immune system, which are widely used in phytotherapy and apitherapy in order to prevent or treat viral infections and cancer, will be discussed in the light of our scientific studies and literature.

**Keywords:** Plants; bee products; immune system.

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### KP-03 Utilization of Biotransformation to Obtain Novel Bioactives Towards Cellular Regeneration and Healthy Aging

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Aging is characterized by abnormalities in cellular functionality, viz., loss of proteostasis, telomere attrition, and increased ROS. These significant alterations eventually lead to age-related disorders like cardiovascular diseases, neurodegeneration, and cancer. Since age-related diseases have become an economic and psychological burden for the community, there is a considerable demand for new prevention and treatment alternatives. With their exceptional chemical diversity and biological activities, natural products have been proposed as potential agents (i.e., resveratrol, cycloastragenol, curcumin, quercetin) for cellular regeneration, healthy aging, and age-related diseases. Biotransformation is the biochemical reactions of living systems or their components (enzymes) to alter molecules. It is an effective tool in obtaining molecules that are difficult to prepare by conventional synthetic methods and has many uses. One of the research topics of our team is the modification of plant secondary metabolites by biotransformation and the investigation of derivatives' bioactivity toward cellular aging and age-related diseases. In the first part of my presentation, I will focus on the molecular mechanism of cycloastragenol, a well-known anti-aging agent, and its derivatives. Mainly, the effects on cellular senescence in terms of NRF-2/proteasome/telomerase systems will be described. Stem cell aging limits the treatment potential of stem/progenitor cell transplantation. In the second part, I will demonstrate the activity of our potent metabolites on stem cell proliferation and differentiation. The cytoprotective actions of our starting compounds are studied extensively; therefore, we have prepared 21 new analogs from a novel cycloartane-type sapogenin, cyclocephagenol, using microbial transformation, and evaluated their neuroprotective activities. In the last section of my speech, I will share several potent neuroprotective agents with you.

**Keywords:** Healthy aging; cellular regeneration.

### KP-04 Certification of Buffer Solutions Reference Materials Using Baucke Cell for Supporting the Quality of pH Measurements

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The need for certified pH reference materials to support the traceability claims and quality of the daily large volume of pH measurements is very strong. In this work, three batches of buffer solutions were prepared in accordance with the instructions laid down in IUPC Recommendation 2002<sup>1</sup>. The first batch was prepared from potassium tetraoxalate (dihydrate) and disodium oxalate to provide pH4 and the second batch was prepared from disodium hydrogen phosphate and potassium dihydrogen phosphate to provide pH7. Meanwhile, the third batch was prepared from sodium hydrogen carbonate and sodium carbonate to provide pH10. Every batch was homogenized by mechanical shaking for one night then bottled into 50 HDPE bottles of volume 250 mL each. Then the stratified random selection was applied to select RM units for homogeneity, stability and characterization studies. The studies were carried out in accordance with the requirements of ISO/IEC 17034 and ISO Guide 35 using a Baucke cell and primary buffers of pH 4, 7 and 10 produced by the Slovak NMI<sup>2-4</sup>. The results obtained showed that the three prepared buffer batches were homogeneous and their certified pH values, 4.0014±0.02, 7.005±0.02 and 10.002±0.02 pH were stable for one-year shelf life. The produced pH CRM samples will be very useful as calibrants and as PT samples for the analytical laboratories performing water, drug, food and environmental analysis.

**Keywords:** pH; buffer solutions.

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## KP-05 The NMISA – Quo vadis? Update on the Activities to Support Food Safety and Security for Africa

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Recently, a survey was initiated on behalf of AFRIMETS (the African regional metrology organisation) to consolidate information on the laboratory food testing capabilities on the African continent. The purpose of the survey was to identify gaps to help inform future food testing capacity building activities within the Africa Continental Free Trade Area (AfCFTA) in support of the African Union's Food Safety Strategy for Africa (FSSA). Survey responses (113) were received from 60% of the countries in Africa and were supplemented with additional ISO/IEC 17025 laboratory accreditation information to reflect the food testing capabilities of 76% of the countries in Africa.

Several laboratories develop their own in-house methods, where method validation using appropriate matrix certified reference materials (CRMs) and proficiency testing (PT) schemes are critical for demonstrating methods are fit-for-purpose. Training needs identified include sample preparation; method validation; analytical techniques such as gas chromatography (GC), liquid chromatography (LC), etc. Other needs include, how to set up specific methods for heavy metals, pesticides, and veterinary drug residue analysis, establishment of metrological traceability and the estimation of uncertainty of measurement. Another laboratory challenge is the maintenance and troubleshooting of analytical instruments, for which training should be prioritised.

The NMISA is committed to supporting food testing laboratories in the African region through the provision of reference materials and proficiency testing (PT) schemes. Calibration solution certified reference materials (CRMs) for the establishment of metrological traceability of the instrument response for a range of analytes, such as mycotoxins and pesticides are available. The NMISA also has matrix CRMs for a range of analytes, such as mycotoxins, pesticides as well as toxic and nutritional elements in several unique African food matrices, such as white maize, cassava as well as others including peanut slurry, wheat flour, cocoa powder, etc.

The PT schemes afford participating laboratories the opportunity to regularly demonstrate their continued technical competence. NMISA is an ISO/IEC 17043 accredited proficiency testing scheme provider and an ISO 17034 accredited reference material producer.

**Keywords:** Food safety; NMISA; CRMs.

## References

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## KP-06 Update on the Status of the New ISO 33400 Series of Standards for the Competent Production and Use of Reference Materials

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The ISO Technical Management Board (TMB) decided in February 2020, that it will be more appropriate for the ISO Committee for Reference Materials (ISO/REMCO) to become an ISO technical committee. As a technical committee, ISO/REMCO could review the scope and purpose of the ISO/REMCO Guides and decide to transform the Guides into other ISO deliverables, including international standards. On 14 December 2020, ISO TMB approved the creation of the new technical committee, ISO/TC 334, *Reference materials*. ISO TMB approved the disbandment of ISO/REMCO on 15 February 2021 and allocated REMCO's published documents and current projects to ISO/TC 334.

This change is a very beneficial change for the committee in all aspects of the activities of the committee. ISO/TC 334 will be able to develop international standards, which has been on the wish list of the committee since 2002. The committee will now be able to decide to transform some, or all, of the guidance documents that it has developed over the years into international standards and will also be able to develop new guidance documents as international standards. As international standards the guidance documents developed for the production and use of reference materials will now have the standing of internationally harmonised documents that can be adopted as part of regulations, as it is the requirement for the European Union (EU) and other countries, such as Japan.

At the first meeting of ISO/TC 334, the decision was taken to transform ISO Guides 30 to 35 as well as ISO Guide 80 into international standards (the ISO 33400 series of standards) without technical change through draft international standard (DIS)-ballots. This presentation will give an overview of the status of the development of the new ISO 33400 series of standards for the competent production and use of reference materials.

**Keywords:** ISO 33400.; standards.

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### KP-07 Bioactive Compounds of Olive Oil and Their Protective Role

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Olive oil, the main lipid source in the Mediterranean diet, is a functional food that contains a high level of monounsaturated fatty acids (MUFAs) and several minor bioactive components with biological properties. Extra virgin olive oil is a food that contains a major saponifiable fraction made up of oleic acid and other saturated and unsaturated acids (linoleic, palmitic, and stearic acids), as well as a minor unsaponifiable fraction that contains a significant amount of vitamins, such as tocopherols, polyphenols (primarily tyrosol, hydroxytyrosol, oleuropein), sterols, phospholipids, carotenoids, chlorophylls, waxes, squalene, other hydrocarbons have protective and antioxidant effects. Hydroxytyrosol, tyrosol, apigenin, luteolin, lignans, oleuropein, and secoiridoids such as oleacein and oleocanthal are the main phenolic compounds present in extra virgin olive oil. The most concentrated phenolic elements in olive oil are secoiridoids and lignans that give extra virgin olive oil several desirable properties, including preventing oxidation, extending shelf life, and imparting bitter, astringent, and pungent organoleptic characteristics. They also exert strong antioxidant activity and show preventive action against cancer and cardiovascular diseases. The bitter tasters in olive oil were the phenolic substances ligstroside aglycon and oleuropein aglycon. A high content of MUFAs may improve the serum lipid profile and decrease the alterations caused by the oxidized low-density lipoproteins and free radicals. Phenolics of olive oil, play an important role on oxidative di-stress, telomere length and successful aging, by just modulating REDOX function. The majority of research on the bioavailability of olive and olive oil phenolics has primarily concentrated on

hydroxytyrosol, tyrosol, and oleuropein. Phenolics absorption in the gut dose and time dependent, and also on the polarity of their chemical structure. Furthermore, the unique individual characteristics of intestinal microbiota can influence phenolic compound bioavailability which may alter the bioaccessibility and antioxidant activity of EVOO's phenolics fraction. The molecules hydroxytyrosol and its derivatives (e.g. oleuropein complex and tyrosol) in accordance with EFSA, are in charge of the beneficial effects of olive oil on human health. [1]–[5]

**Keywords:** Olive oil; bioactive compounds.

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## KP-08 A Promising New Generation Probiotic Candidate: *Akkermansia muciniphila*

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Probiotics are widely used in agriculture, food, and health. Studies on the role of intestinal commensal bacteria in health promotion have rapidly received much more attention beyond classical pathogens in the last decade.<sup>1</sup> A strategy to modulate the gut microbiota structure is being studied extensively to overcome cardiovascular diseases, cancer, and neurodegenerative diseases. While traditional probiotics usually show marginal curative effects for these problems, new-generation probiotics have begun to emerge as new preventive and potential therapeutic tools. Recent studies have revealed many potential new-generation probiotics candidates in human microbiota.<sup>2</sup>

A new-generation probiotic candidate, *Akkermansia muciniphila*, is a GUT bacteria isolated from a human stool sample. *A. muciniphila* is considered a promising candidate for a new generation of probiotics, which can use mucin as the sole source of carbon, nitrogen, and energy, given the physiological benefits from animal and human studies.<sup>3</sup> *A. muciniphila*, which frequently colonizes the intestinal mucosal layer of individuals has been consistently recognized as a promising candidate for new-generation probiotics due to its biological advantages derived from *in vitro* and *in vivo* research. Not only as a crucial biomarker of human physiology, but it has also the potential to be a probiotic, given its physiological benefits in various clinical studies.<sup>4</sup> In this study, a brief description of *Akkermansia muciniphila*, which is a common colonizer in the intestinal mucus layer of humans will be given.

**Keywords:** Probiotic candidate; *akkermansia muciniphila*.

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## KP-09 The Art of Using Plants for Weight Management

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The World Health Organization (WHO) defines obesity as an “abnormal or excessive fat accumulation that may impair health,” further clarifying that “the fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended.”<sup>(1)</sup> Excess adiposity is a risk factor for developing co-morbidities such as type 2 diabetes (T2D), cardiovascular disease, and dyslipidemia, all of which can reduce longevity.<sup>(2)</sup> Obesity and its attendant conditions have become major health problems worldwide, and obesity is currently ranked as the fifth most common leading cause of death globally.<sup>(3)</sup> The conventional therapy of obesity mainly involves synthetic moieties and surgical procedures, which have many harmful side effects and chances of recurrence with severity.<sup>(4)</sup> Plant-derived medicines are considered to be the first line of defense in maintaining health by combating diseases and their complications.<sup>(5)</sup> Therefore, the use of some plants and their products could be an effective strategy for the management of obesity and associated disorders.<sup>(4)</sup> Studies with *Camellia sinensis* L., *Crocus sativus* L., *Nigella sativa* L., Oolong tea, *Irvingia gabonensis*, and *Vaccinium myrtillus* L. have been conducted, and especially *Nigella sativa*, *Camellia sinensis*, and green tea have shown satisfactory antiobesity properties.<sup>(6)</sup> It is also important to clarify the antiobesity mechanisms of medicinal plants. For instance, polyphenols obtained from tea extracts including epigallocatechin, epigallocatechin-3-gallate, L-epicatechin, and epicatechin-3-gallate have shown inhibitory activity against pancreatic lipase, leading to weight loss.<sup>(7)</sup> In accordance with researches and especially clinical studies, it is necessary to use the plants at the appropriate time and in the appropriate amount according to the desired effect in a way that does not cause side effects. As a result, phytotherapy can be an adjunct treatment in the treatment of obesity and using medicinal plants for weight management is an art.

**Keywords:** Weight management; phytotherapy.

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## KP-10 The Potential Use of Algae as Functional Food

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Algae are photosynthetic organisms that are found in a variety of aquatic environments, from oceans to freshwater lakes and ponds. Functional foods are foods that provide health benefits beyond basic nutrition<sup>1,2</sup>. They may contain bioactive compounds that can help prevent or treat certain diseases or promote overall health and wellness. Algae, which can be classified as macroalgae (seaweed) and microalgae (single-celled algae) have the potential to be used as functional food or food ingredients. They contain several bioactive compounds, including phycocyanins, carotenoids, polysaccharides, and polyunsaturated fatty acids, that have been linked to a range of health benefits<sup>2</sup>.

One of the potential uses of algae as functional food is in the production of dietary supplements. Macroalgae are a rich source of dietary fiber, vitamins, minerals, and bioactive compounds such as carotenoids, phycobiliproteins, and polyphenols. These compounds have been linked to various health benefits, including antioxidant and anti-inflammatory properties, and the ability to reduce blood pressure and cholesterol levels. Macroalgae are already used in many traditional cuisines, particularly in Asian countries such as Japan, Korea, and China. They are used in dishes such as seaweed salads, soups, and sushi rolls. In addition, macroalgae can be used as an ingredient in food products such as snacks, crackers, and bread<sup>1,2</sup>.

Microalgae, on the other hand, are a rich source of protein, omega-3 fatty acids, and various vitamins and minerals. They also contain bioactive compounds such as phycocyanins and carotenoids, which have been linked to health benefits such as antioxidant and anti-inflammatory properties, and the

ability to improve immune function and reduce the risk of chronic diseases. They are already used as a source of protein and omega-3 fatty acids in dietary supplements and functional foods, such as protein powders and bars. They can also be used as an ingredient in food products such as beverages, smoothies, and plant-based dairy alternatives. Algae can also be used as a food ingredient in a variety of products, including baked goods, snacks, and beverages. For example, spirulina, a type of blue-green algae, is used as a natural food coloring in some products, while chlorella, another type of algae, is used as a protein source in some plant-based foods<sup>3</sup>. However, there are also challenges associated with using algae as functional food, such as ensuring their safety for consumption, developing products that are appealing to consumers, and making sure that the cultivation and harvesting of algae is sustainable and environmentally friendly. Further research is needed to fully understand the potential health benefits of algae and to develop products that are both appealing and safe for widespread consumption.

**Keywords:** Algae; functional food.

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## KP-12 The Effect of Pre-Roasting Processes on the Characteristics Properties of Pumpkin Seed Oil as a Functional Product

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In this study, pumpkin seed oils obtained from roasted and unroasted seeds of the two genotypes called as “Nevşehir Çerçevesi” and “Ürgüp Sivrisi” belonging to the species *Cucurbita pepo* were analyzed for quality and thermal characteristics. Oil extraction from seeds subjected to three different pre-treatments (unsalted, dry salted and wet salted) before roasting and sun-dried unroasted seeds was carried out by means of a screw press. The p-anisidine, peroxide and TBARS (thiobarbituric acid reactive substances) values of oils obtained from sun-dried unroasted seeds and roasted seeds after wet salting process were lower than the other sample groups ( $p < 0.05$ ). The obtained oils were rich in Zn, Fe, Mg, Se, Ca, K and Na minerals, and palmitic, stearic, oleic and linoleic fatty acids. Thermal characteristics (cooling-

melting curves and the oxidative induction time (IT) at four different isothermal temperatures (110°C, 120°C, 130°C and 140°C) were determined using differential scanning calorimetry (DSC). The results indicate that an increase in the DSC isothermal temperature resulted in a decrease in induction time (IT), and the highest IT was observed in the oils obtained from sun-dried unroasted seeds.

**Keywords:** Pumpkin seed oil; pre-roasting.

## KP-14 Importance of Functional Foods in Brain Health

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Functional Foods, also known as nutraceuticals, include foods fortified with vitamins, minerals, probiotics, fibers etc. Nutrient-rich ingredients, such as vegetables, fruits, nuts, seeds, and grains are considered functional foods. They are protective against diseases, and prevent nutrient deficiencies, and promote proper growth and development. In recent years, functional foods have gained more popularity within health and wellness circles. Some of them contain supplements or other additional ingredients designated to improve health [1-3]. Functional foods have health promoting benefits over and above their basic nutritional value. They may be classified as Probiotics/Prebiotics, Plant Sterols, Terpenoids and Phenolic antioxidants. Omega-3 Fatty acids, mainly Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA), they are obtained from two sources, plants and fish. Mushrooms rich in fat soluble vitamins along with ergosterol content are thought to be the only vegetarian source for vitamin D. Polysaccharides, a type of fiber like  $\beta$  glucans boost up the nutritional value of mushrooms. In fact, effective plant constituents are called specifically “Secondary Metabolites” offer various health benefits besides protection of themselves against some diseases. In a recent study, entitled “Novel Nutraceutical Compounds in Alzheimer Prevention” several secondary metabolites (quercetin, anthocyanins, luteolin, ferulic acid, chlorogenic acid, kaempferol) as well as probiotics/prebiotics and garlic and its main bioactive compound S-allylcysteine were evaluated with a multitarget therapeutic approach within a mechanistic insight [3].

Anatolia has over 11.000 flowering plant species with high endemism ratio (33%). Among them, many plants have been used as foods or drinks since ancient times. Our group have studied some of the extracts prepared from selected Lamiaceae species for their anti-cholinesterase activity and antioxidant properties, *in vitro* [4-5]. The most active extracts were further investigated for their bioactive constituents, and the results will be presented herein which verify their potential neuroprotective

and anti-Alzheimer effects with functional foods properties in brain health.

**Keywords:** Brain health; anti-Alzheimer; EPA; DHA.

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## KP-15 Importance of Proteins Within the Scope of Food Sustainability and New Alternative Protein Sources

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The food sector is known to play a significant role in climate change and agricultural practices are placing increasing strain on the planet's biosphere and biodiversity. Livestock farming is under particular scrutiny for its greenhouse gases (GHG) emissions-related impact to climate change, and it is one of the main causes of deforestation in many parts of the world for pastoral land for raising animals, and arable land to grow crops for animal feed. Because of the direct release of methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) from animals as well as the indirect release of these gases due to the breakdown of manure, animal husbandry is also seen as an activity contributing to climate change. Thus, there is an ongoing global quest for alternative technology and production processes that can provide food with a less environmental impact while maintaining or even improving upon the nutritional and sensory qualities of animal products. Plant proteins, edible insects, seaweed, microalgae, and cell-culture based proteins (such as lab-grown meats and cultured milk and eggs), protein hydrolysates, bioactive peptides can be alternatives to animal proteins with a lower environmental footprint. For this purpose, in this review, importance of proteins within the scope of food sustainability and new alternative protein sources will be mentioned.

**Keywords:** Plant proteins; food sustainability.



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## KP-16 Edible Flowers as Aa Source of Bioactive Compounds

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The ornamental use of flowers in addition to their use for the obtention of infusions or in gastronomy has existed since ancient times. From the point of view of gastronomy, the early use of flowers was due to the color they confer to the dishes, with an ornamental role; however, today, flowers are also used to be eaten. Edible flowers and their extracts, and their health benefits related to cardiovascular diseases, cancer, neurological diseases, diabetes, obesity, in addition to their hepatoprotective and microbicidal effects. Edible flowers have a high content in phenolic compounds and a high antioxidant capacity, property that confers positive effects on oxidative stress-related diseases [1,2]. The advanced analytical techniques allowed us to reveal the chemical composition of edible flowers and identify new compounds and effects that were not known until recently. The identification and quantification of phenolic compounds present in edible flowers is extremely important for their inclusion in functional foods. Among the numerous phenolic constituents existing in nature, phenolic acids (hydroxycinnamic and hydroxybenzoic acids) and flavonoids (anthocyanin, chalcone, flavanones, flavones, and flavonols) are highlighted as the majority and of high bioactive potential in edible flowers [3].

Considering the numerous species of edible flowers, the presentation aims to categorize the various species depending on their chemical composition and also to present the main groups of compounds that are usually present in the species that are most commonly used for health purposes.

**Keywords:** Bioactive compounds; flavonoids; edible flowers.

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## KP-17 Using Cold Plasma Technique as an Alternative and Novel Method in Food Processing

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Non-thermal processing technologies have gained significant attraction from both the food industry and food scientists in order to replace conventional processing technologies and reduce chemical usage in the food industry. These novel technologies such as high hydrostatic pressure (HHP), high pressure homogenization (HPH), irradiation, ultrasound (US), ultrafiltration, supercritical carbon dioxide, cold plasma technology (CP), which are not based on chemical and heat treatment, are used today to improve the functionality of various macromolecules, and increase the shelf life of the product. One of the advantage of these physical methods is short time requirement when compared with the chemical methods. Among these technologies, CP has stepped forward due to its relatively low investment cost, a simple mechanism of action based on reactive species, applicability to all types of food products regardless of their physical form, a wide variety of electrode configurations, ease of scale-up, operational flexibility, low processing times and energy consumption, and low processing costs. CP is a quasi-neutral

ionized gas containing different reactive species such as electrons, positive and negative ions, free radicals, and gas atoms and molecules in the excited or ground state, resulting from the application of electrical, thermal, or electromagnetic energy to a gas in order to reorganize the electronic structure of the species (atoms and molecules) and to generate excited species and ions. These reactive species may lead to the inactivation of microorganisms via oxidation of proteins, lipids, and DNA in microbial cells or modification of polymers and macromolecules by etching, cross-linking, oxidation, and incorporation of functional groups. Also, CP is known as a eco-friendly, fast and cost effective non-thermal physical method applied for disinfection and modification purposes in the food industry. This method modified various macromolecules with several effects: (i) unfolding/structural changes, (ii) cleaving of micro- and macromolecules, (iii) cross linking, (iv) side-chain modification. Depending on the used gas, distance and time period, the effects of cold plasma is varied. Apart from general microbial inactivation and modification effects, CP can induce different chemical reactions depending on the concentration and type of the formed reactive species during discharge. CP technique can the improve solubility and wettability of food powders such as proteins due to the surface oxidation, incorporation of hydrophilic functional groups on the surface. In this study, the interactions between reactive plasma species and proteins, lipids, and polysaccharides by considering food processing were discussed.

**Keywords:** Cold plasma technique; non-thermal processing; high pressure homogenization.

## OP-01 Secondary Metabolites of *Origanum* L. (Lamiaceae)

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The genus *Origanum* is one of the most important genera in the Lamiaceae family and contains 42 species and is mainly distributed around the Mediterranean, Euro-Siberian and Iran-Siberian regions. The members of this genus have been used as a spice and herbal tea and in complementary medicine to treat various diseases. In this study, secondary metabolites of the *Origanum* L. genus have been reviewed. In studies conducted on mainly in the aerial parts of *Origanum* species,

several different classes of monoterpenoids, phenolics, flavonoids, diterpenoids, triterpenoids, steroids and fatty acids were reported. For the essential oil the major components of *Origanum* were reported as various terpenes with the predominant occurrence of carvacrol, thymol, p-cymene and γ-terpinene. In terms of phenolic constituents, it is reported that they included high amounts of phenolic acids (rosmarinic acid, gallic acid, caffeic acid and p-hydroxybenzoic acid), and flavonoids (kaempferol, apigenin, luteolin, salvigenin, penduletin and quercetin). Furthermore, six diterpenes, sixteen triterpenes, ten steroids and five fatty acids have been characterized in *Origanum* species. Phytochemical studies have revealed that *Origanum* species are rich in secondary metabolites, especially monoterpenes.

**Keywords:** *Origanum*; Lamiaceae; phenolics; secondary metabolites; terpenoids.

\*This study was published as a chapter in: "Oregano" The genus *Origanum* (Lamiaceae) Taxonomy, Cultivation, Chemistry, and Uses, Editor: Tuncay Dirmenci.

## OP-02 Sustainability, Innovation and Green Chemistry for Valorization of by-Products From Olive Oil Industry

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Olive oil industry has an important economic, environmental and social impact in the Mediterranean countries, generating about 98% of the world olive-oil production. The rising popularity of olive oil is attributed not only to its sensory characteristics but also to its healthy properties which have led in the two last decades to a steady increase on its production and consumption in all over the world. However, despite to the economic benefits and the functional properties beyond the nutritional attributes of the olive oil, this sector is associated with environmental problems derived from the huge quantity of residues and by-products generated along the productive process. A range of waste stream/by-products including olive leaves, stones, olive pomace, olive mill wastewater that are good source of bioactive molecules currently underused for limited/low-value applications, signifying the inefficiency of the processing system currently used for their extraction/recovery. Innovative approach based on green chemistry procedures, which appear to be a promising tool to increase the applications of the extracting bioactive compounds such as polyphenols from olive oil industry. The green extraction techniques such as ultrasounds, microwave, pressurized liquid, pulsed electric fields, high voltages electrical discharges, infrared irradiation, supercritical fluid extraction, and subcritical water extraction have been recently developed to enhance both the extraction efficiency and the quality of valorized products from olive



industry by products as an alternative to conventional methods. Sustainable processing to produce phenolic-rich and optimally valorized by-products will allow using of these residues enhancing the profitability of the olive oil industry and their incorporation into the formulation of functional foods opens new possibilities in the field of innovative foods [1]–[3].

**Keywords:** Green chemistry; olive oil industry.

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### OP-03 Determination of Antioxidant Effect of Myrtle and Thyme Essential Oils on Some Vegetable Oils

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In this study, thyme and myrtle essential oils were used to increase the oxidative stability of corn and sunflower oils. Thyme and myrtle essential oils, were added to sunflower and corn oils and 30% oil-in-water emulsions and frying oils at a rate of 100 mg/kg and their antioxidant properties were evaluated at the end of storage and frying process. It has been found that the oil most prone to oxidative degradation is sunflower oil, thyme and myrtle essential oils were effective in increasing and/or protecting the phenolic content and increasing antioxidant activity in sunflower and corn oils and oil-in-water emulsions during storage, and in frying oils during the frying process. Thyme essential oil was found to be effective in reducing peroxide value in sunflower oil, and myrtle essential oil in reducing TBA values in corn oil. In sunflower and corn oil-in-water emulsions, the antioxidant effect of thyme and myrtle essential oil was pH dependent, and essential oils were found to be more effective in emulsions prepared at pH 3.4 and 5.4. In frying oils, it was found that after frying at 180 °C for 10 hours, myrtle essential oil was effective in reducing the peroxide value and TBA value, and especially in preventing darkening of the color. As a result, it was concluded that thyme and myrtle essential oils can be used as natural antioxidants in sunflower and corn oil, sunflower and corn oil emulsions (pH<7) and in frying oils as a natural sources of antioxidants.[1-3].

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**Keywords:** Myrtle; thyme; essential oils; antioxidant effect.

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### OP-04 Bioactive Compounds of Butter

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Milk and dairy products are integral part of human nutrition and they are considered as the carriers of higher biological value proteins, calcium, essential fatty acids, amino acids, fat, water soluble vitamins and several bioactive compounds that are highly significant for several biochemical and physiological functions. When milk fat is churned, the membrane surrounding the fat globules is disrupted and the free fat released from the globules coalesces. This process ultimately results in a solid fat phase, namely butter, and an aqueous phase, also known as churn buttermilk. Buttermilk has a long history of anecdotal healthpromoting associations, though it does not currently generate any added value in the marketplace for delivering nutritional benefit. Butter is a water-in-oil emulsion consisting of fat (80–82%) and an aqueous phase (18–20%) containing salt and milk-solids-not-fat. The upper legal limit for water is 16%, according to TS1331 (2015). Butter is made from cow milk (3–4% fat) that is converted first to cream (30–45% fat) by centrifuge. There are several components in milk fat that could influence health positively. Functionally, fatty acids are precursors of a variety of bioactive lipid molecules. For example, arachidonic acid is the precursor of eicosanoids, which function as signaling molecules through specific receptors and play important roles in inflammatory processes. Since high intakes of particular omega-3 fatty acids which includes conjugated linoleic acid (CLA) can assist in the ailment and disorder prohibition and help in maintaining and control of metabolism in humans, manage plasma TG and cardiovascular functions, decreasing and lowering cancer promoting, as well as obstructing tumor growth and metastasis from cancer breasts. Owing to their important biological activity as major components of biological membranes, glycerophospholipids have been associated with various conditions such as

cardiovascular diseases, cognitive and memory problems, inflammatory processes, diabetes and cancer [1-3].

**Keywords:** Butter; bioactive compounds.

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### OP-05 Green Analysis Opens Frontiers in Food Safety

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Climate change, desertification, environmental problems and unsustainable production, consumption and life styles combined with the population growth have led to an unprecedented combination of pressures and trends can disrupt or enhance the safety of food. Foodborne hazards can occur in any part of the food chain and can have negative impact on human health and cause illnesses (i.e., malaria, tuberculosis, AIDS), disability and can be lethal<sup>1</sup>. Hence, human health, which relies on food and nutrition security and food safety, highlighted the importance of ensuring food safety to reach the goals set forth in the 2030 Agenda for Sustainable Development and the UN Decade of Action on Nutrition. However, the gold standard methods for quantitative chemical food safety testing in official laboratories rely largely on sampling and transferring the samples to a central laboratory to be tested by highly trained personnel and use of expensive equipments (i.e., LC-MS or GC-MS)<sup>2</sup>. Hence, there is an increasing need and demand for portable and handheld devices to provide rapid, eco-efficient, and on-site screening of food contaminants. The current technological trends rely on smartphone-based, microfluidic chip-based, and paper-based devices integrated with electrochemical and optical biosensing platforms in line with the World Health Organization benchmark for diagnostic tests (i.e., the Affordable, Sensitive, Specific, User-friendly, Rapid and Robust, Equipment-free, and Deliverable to end-users (ASSURED) criteria)<sup>1</sup>. Thus, the best features of different technologies should be combined to bridge technological gaps and meet commercialization requirements. In this work, the merits and demerits of current methods and

methodologies used in analysis for food safety are presented together with the frontiers that the green analysis offers.

**Keywords:** Green analysis.

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### OP-06 The Production of Probiotic Strained (Torba) Yoghurt Fortified with Some Medicinal and Aromatic Plants: Antioxidant and Phenolic Potential

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In this study, functional properties of strained (torba) yoghurt that was produced from cow, sheep, goat milk and their equal amounts of double (sheep+cow, goat+cow) and triple (cow+sheep+goat) mixture were tried to be improved by using probiotic bacteria (*Lactobacillus casei* and *Bifidobacterium longum*) and medicinal and aromatic herbs (thyme; *Origanum onites* L., rosemary; *Rosmarinus officinalis* L., basil; *Ocimum basilicum* L., mint; *Mentha piperita* L.). The antioxidant capacity (2,2-diphenyl-1-picrylhydrazyl radical scavenging activity; DPPH) and total phenolic content (folin-ciocalteu's phenol reagent) of these yoghurts throughout the storage period (on the 1st, 10th, 20th and 30th days) were determined and results were statistically evaluated. In addition, phenolic components of the yoghurts were determined during the first day and the last day of storage. The highest DPPH radical inhibition rate was determined in cow+goat milk yoghurt with rosemary (95.9±0.001 %) on the 10<sup>th</sup> storage day. The highest phenolic capacity was recorded on day 10<sup>th</sup> for cow milk with rosemary yoghurt (107.08±1.24 mg GAE/100g). Statistically, when the % DPPH radical scavenging activity rate and the total phenolic content of the yogurts were examined; it was determined that milk type, the presence of different plants, and storage time were were significant at p<0.01 as well as the milk\*plant, milk\*storage and plant\*storage and milk\*plant\*storage interactions. Gallic acid, catechin hydrate, ferulic acid, chlorogenic acid, rutin, cesretin-3-

glucoside, ellagic acid, luteolin, apigenin were analyzed. It was observed that the balance of phenolic changes throughout the storage period. Both the milk used in making strained yoghurt and the plants affected the phenolic component content. Consequently, the study produced results showing that the strained yoghurt, widely consumed traditional fermented dairy products, was suitable for the delivery of medicinal and aromatic plants, which have many benefits for human health, to consumers.

**Keywords:** Functional foods; strained yogurt; medicinal; aromatic plants.

### OP-07 Quality Assessment of Oils Obtained from Black and Red Currant Seeds in Ultrasound-Assisted Extraction Process

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Fruit pomaces, left after juice or wine production are considered as a waste. They contain up to 80% of seeds, which may be a source of oil<sup>1</sup>. To reduce the waste and fulfil the circular economy requirements they can be further processed in extraction process. The conventional methods of extractions are being replaced by alternative extraction methods, which may be beneficial in terms of energy and solvents consumption and selectivity of the process. One of the techniques, considered as 'green' is ultrasound-assisted extraction<sup>2</sup>. The aim of the study was to evaluate the oxidative stability, melting characteristics and oxidation reaction kinetics of oils obtained from black and red currant seeds using sonication. Ultrasound-assisted extraction of oil was conducted in ultrasound processor, with hexane as a solvent, applying variable values of ultrasound amplitude (30%, 75% and 80%) and sonication time (5, 12 and 20 min) accompanied by samples untreated with ultrasound as controls. Pressurized differential scanning calorimetry was performed to obtain the values of induction time of oxidation reaction, also differential scanning calorimetry to obtain melting curves of oils was done. Kinetic parameters were calculated using Ozawa-Flynn-Wall methodology and Arrhenius equation<sup>3</sup>. It was concluded that sonication amplitude of 75% and time of 12 min resulted in obtaining oil with significantly higher oxidative stability. In kinetic parameters analysis, it was noticed that ultrasound treatment decreased activation energy of black currant seed oil. Melting profile showed only slight differences between oils obtained using sonication and the control ones. The course of the curves for both red currant and black currant oils was characterized by an endothermic peak in the area indicating

poly- and monounsaturated fatty acids presence and also a minor peak indicating trace presence of saturated fatty acids which was confirmed in the past studies found in literature<sup>4</sup>. Sonication is a promising tool to obtain oil from fruit wastes, however the process needs to be optimized to maximize the benefits in terms of oil quality.

**Keywords:** Currant seed; ultrasound-assisted extraction process.

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### OP-08 Versatile Probing of Multi-Class Antibiotic Residues in Honey by Utilizing A Novel Methodology: UHPLC-ESI-MS/MS Analysis Integrated with Ion-Paired Equilibrated Online-SPE Pretreatment

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The use of antibiotics to prevent bee diseases can cause significant residue problems in honey. Residues lead to health problems such as antibiotic resistance and allergic reactions [1]. There are numerous studies in the literature using various pretreatment and chromatographic techniques for multi-class antibiotic residue analyses [2]. We developed a straightforward UHPLC-MS/MS analytical method for the simultaneous determination of macrolides, tetracyclines,

sulfonamides, amphenicols, fluoroquinolones, nitroimidazoles, and aminoglycosides by integrating a practical dilute & shoot pretreatment method with ion-pair chromatography and online-SPE technique. The method was meticulously designed to monitor each molecule efficiently taking into account the matrix properties of honey but also the unique conjugations such as N-glucosylated sulfonamides. Simultaneous analysis of aminoglycosides on reversed-phase interaction chromatography without any derivatization was also accomplished. With this validated method, honey samples from different botanical origins ( $n=87$ ) were analyzed for 22 different antibiotics and 26.4% of them were found to contain residues. The presented methodology enabled the analysis of comprehensive sample sets in a rapid, practical, and cost-effective way. Additionally, performed analysis reflected the emerging antibiotic residue problem in honey.

**Keywords:** Multi-class antibiotic residues; honey; UHPLC-MS/MS.

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### OP-09 Processing Factors of Pesticide Residues in Cucumber Pickles Using LC MS/MS

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The intense use of pesticides against plant pests and diseases during cucumber growing in greenhouses may lead to high levels of pesticide residues in the final product. The concentration of pesticide residues in cucumber fruits can change during subsequent pickle processing steps and could be affected with washing, sterilising or keeping at low pH levels during fermentation<sup>1</sup>. This study was conducted to detect the residue levels of 2 acaricides, 3 insecticides and 6 fungicides in cucumbers grown at greenhouse during each step of pickling processing (washing, fermentation and pasteurisation). Pesticides were applied at their recommended field doses with a knapsack sprayer under greenhouse conditions on three independent plots 3 days before harvesting (Preharvest interval-PHI). After harvesting, raw materials were processed with two different processing techniques (canned and fermented) according to Compendium of Representative Processing Techniques Investigated in Regulatory Studies for Pesticides<sup>2</sup>. The extraction and cleaning up of the pesticides, namely,

acetamiprid, ametoctradin, azoxystrobin, chlorantraniliprole, deltamethrin, difenoconazole, dimethomorph, etoxazole, fluopicolide, propamocarb and spiromesifen, were conducted by using QuEChERS method<sup>3</sup>. The residue levels were detected with LC MS/MS. The multi-residue analysis method was validated according to the SANTE guidelines<sup>4,5</sup>. The processing factor (pf) values obtained during canned pickle processing steps such as washing, pasteurisation and storage (21 days), were found as 0.25-1.10; 0.03-0.89; 0.01-0.68, respectively. The pf values of fermented pickle processing steps like washing, fermentation and pasteurisation, ranged with 0.39-0.98; 0.03-0.79; 0.01-0.85, respectively. During both types of pickle processes, pesticide residues remained lower than the Maximum Residue Levels. This study was funded by the collaboration of Bursa Uludag University and Perla Fruit Company with the grant number FKA-2021-531.

**Keywords:** Pesticide residues; cucumber; LC MS/MS.

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## OP-14 The Effect of Different Drying Methods and Temperatures on Drying Kinetic, Bioactive and Color Properties of Kiwi Fruit

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This study aimed to investigate the effects on drying rate and some quality properties of kiwi fruit samples using freeze drying (FD), at 50, 60 and 70 °C ultrasound assisted vacuum drying (UAVD), vacuum drying (VD) and hot air (HAD) drying. The effects of different drying methods on the antioxidant activities and color properties of kiwi fruit samples were evaluated. Different temperatures and different drying methods significantly affected all parameters of kiwi fruit samples ( $P < 0.05$ ). At 50°C the drying time of the Kiwi samples was 390 min, 420 min, and 600 min for UAVD, VD, and HAD, respectively. At 60°C the drying time of the Kiwi samples was 300 min, 360 min, and 450 min for UAVD, VD, and HAD, respectively. At 70°C the drying time of the Kiwi samples was 240 min, 270 min, and 450 min for UAVD, VD, and HAD, respectively. According to total phenolic content (TPC) and antioxidant activity (DPPH and ABTS method) analysis, FD retained more bioactive compounds than other methods, followed by UAVD (60°C). Compared to other dried samples, FD had the highest color quality, while UAVD and VD showed shorter drying times compared to HAD. It has been suggested that different temperatures can be used for drying kiwi fruit with the UAVD, VD technique, which is an alternative to the HAD technique due to higher bioactive component, better color and surface quality in the drying of kiwifruit. Therefore, UAVD and VD can be used successfully to dry kiwi fruit, and higher drying rate and bioactive compounds can be preserved.

**Keywords:** Kiwi fruit; freeze drying; ultrasound assisted vacuum drying.

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## OP-15 Straightforward Monitoring of Honey with Foreign Diastase by Leveraging the Differentiation in LC-UV Proteome Profiles of Authentic and Fraudulent Samples

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Fraudulent honey may also be prepared by the direct addition of foreign  $\alpha$ -amylases (foreign diastase, FD) [1]. Indicated manipulation is carried out mainly to increase the diastase levels [2]. The main objective of this study was to accurately determine FD in honey. For method development, honey proteins were isolated by serial ultrafiltration. Next, diastase and invertase were purified from isolate. Subsequently, purified enzymes were used as authentic analytical references. With the hyphenation of optimized chromatographic resolution and dilute & shoot pretreatment, Foreign Amylase Monitoring (FAM) method was introduced. Precise ( $RSD_R; 1.27\%$ ), and linear (mean  $R^2 > 0.995$ ) results were able to obtain. Industrial  $\alpha$ -amylases and honeys ( $n=202$ ) were probed using FAM. A total of 74 samples were found to contain FD. The presence of FD was correlated with abnormally high diastase activities. Performed trend analysis allowed us to decipher a dramatic increase in FD existence and this revealed the recently emerging problem of honey authenticity.

**Keywords:** Foreign diastase; LC-UV.

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## OP-16 Production of Plant Based Drink and Low-Fat Plant Based Ice Cream Using Cold Pressed Black Cumin Seed Oil By-Product

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In this study, it was aimed to use vegan milk obtained from cold-pressed black seed oil by-product (BOB) in the production of low-fat vegan ice cream and to use BOB as a fat replacer and stabilizer. For this purpose, rheological properties of ice cream mixtures and melting properties, color, overflow and sensory properties of ice cream samples were investigated. Low-fat vegan ice cream mixes were formulated using control vegan ice cream samples containing 0.4% xanthan gum (XG), 2.5% fat, 1-3% BOB and BOB milk, and 2.5-12.5% fat. All of the ice cream mixes showed non-Newtonian flow behavior. There was a significant difference between the consistency coefficient (K) values of the emulsion samples ( $p < 0.05$ ). The rheological properties of the emulsions were significantly affected by the optimization parameters ( $p < 0.05$ ). Ice cream production was carried out using 6 different formulations (low fat, medium fat, high fat control vegan ice cream and low fat vegan ice cream containing 1-3% BOB). The G' value of the ice cream samples is higher than the G'' value at all frequency levels. No positive or negative effects were observed on the melting profile and sensory properties of ice cream samples using BOB in ice cream production.

**Keywords:** Black cumin seed oil.

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## OP-17 Analysis of Glyphosate and Other Highly Polarity Pesticide Residues by LC-MS/MS Method in Various Food Products

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Glyphosate and other pesticides are widely used in agriculture to improve crop quality and production efficiency, as well as to combat weeds and pests that compete with crops. The long-term effects of polar pesticides, which are generally applied before planting and to optimize the ripening process, are

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worrisome but need to be monitored. [1] Due to the physicochemical properties of high polarity pesticides, pesticides in many different groups are difficult to analyze with the QuEChERS methodology, which is a joint extraction procedure. For this purpose, The Quick Extraction of Polar Pesticides (QuPPE) method for single residue methods (EURL-SRM) was developed by the European Reference Laboratories in 2008. However, modifications in analytical and chromatographic conditions still continue in the QuPPE method. Tandem mass spectrometry (LC-MS/MS) combined with liquid chromatography provides highly sensitive and selective detection for the analysis of YPPs, since the choice of analytical column, matrix effect, efficiency in the extraction will be effective in the detection of highly polar pesticides (YPP). In this study, chromatographic separation was achieved with new generation columns, and quick and easy procedures were developed by extraction from various foods with acidic methanol. [2,3,4]

**Keywords:** Glyphosate; pesticide residues; LC-MS/MS.

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## OP-18 A New Approach for Enrichment of Functional Properties of Ice Cream

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Ice cream is being the most commonly consumed foods, is good sources for protein intake<sup>1</sup>. But its polyunsaturated fatty acids and phenolic content is low<sup>2</sup>. With the increase in consumer awareness about the nutritional and biological value of products, there has been a demand for ice cream enriched with bioactive substances and other nutrients in recent years. Many products reflected positive effects on consumer health have been developed using plant-based additives which improve the color and flavor of ice cream<sup>3</sup>. Nowadays, functional food products are developed by using powder, puree, pulp, juice, fiber and extract of fruits and vegetables<sup>4</sup>.



Successful studies have been carried out in obtaining functional products by adding different fruit and vegetable extracts to ice creams. In some of the studies<sup>5-6</sup>, apple, orange, bamboo, oat and wheat fiber and inulin fibers were added to the ice cream mixtures to develop their physical and chemical quality.

The effect of using dietary fibers produced from apple, orange and pumpkin fruits at different concentrations (1.5% and 3.0%) in ice cream production on quality and nutritional properties was investigated. The results showed that the addition of fiber highly improved both chemical and sensory properties of the ice cream.

**Keywords:** Functional properties; ice cream; dietary fibers.

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## OP-19 Characterization of Siirt Propolis Extracts Obtained with Water and Ethanol by LC-MS/MS, Determination of their Effects on Antioxidant and Diabetes

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Propolis, an extremely complex resinous material, is collected by honeybees, commonly called *Apis mellifera* and exhibits valuable pharmacological and biological properties attributed to the presence of polyphenols<sup>[1]</sup>. It was reported that propolis has a very strong antibacterial, antiviral, antifungal, antitumor, anti-inflammatory, anticancer and immunomodulatory effects<sup>[2]</sup>. Propolis, consisting of approximately 300 different compounds, has a complex structure and is usually extracted with solvents such as glycerol, ethyl alcohol, water, and propylene glycol. But even in these solvents, its solubility is very low.

In this study, extractions were carried out by using solvent systems consisting of water and ethanol to increase the solubility, at a maximum temperature of 60°C, by mixing in the reflux mechanism. Its phenolic contents were determined by LC-MS/MS technique. As a result of the analysis, the most common phenolic components among 18 standard substances; Pinosembrian ranks first, followed by Caffeic acid, Galangin, Chrysin, CAPE, Apigenin and Genistein, respectively. Propolis extract obtained, ABTS and DPPH methods antioxidant effect, the antidiabetes effect was investigated by  $\alpha$ -Amylase and  $\alpha$ -Glycosidase enzymes inhibition activities of enzymes.

**Keywords:** Propolis extracts; antioxidant, diabetes.

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## OP-20 Membrane Fouling Mechanism in Dairy Industry

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Membrane filtration techniques (microfiltration, ultrafiltration, nanofiltration and reverse osmosis) have been used to remove bacteria and spores from milk, to condense milk or whey, and to separate protein fractions in the dairy industry<sup>1</sup>. The main membrane performance indicators are flux and selectivity<sup>2</sup>. The higher the flux, the better the performance, during membrane filtration<sup>3</sup>. The flux and selectivity properties in filtration could be related to fouling mechanisms<sup>4</sup>. The first rapid flux decline in a few minutes of processing is generally ascribed to concentration polarization<sup>5</sup>. It is described as the increased solute concentration near the membrane surface leads a severe increase in osmotic pressure and thus reducing the effective transmembrane pressure and flux<sup>3</sup>. Fouling happens when molecules or aggregates from the feed solution accumulate on the surface or inside the membrane pores, progressively plugging them and impeding filtration<sup>6</sup>. Proteins and minerals are the main compounds responsible for membrane fouling in the dairy industry<sup>4</sup>. Fouling is a complex system and is affected by operating parameters (concentration, pH and ionic strength of the feed solution, temperature, transmembrane pressure etc.), protein properties (structure, size, aggregation properties etc.) and membrane properties (pore size, surface charge etc.)<sup>6</sup>. In this study, we have focused on the effect of various parameters on membrane fouling.

**Keywords:** Membrane filtration techniques; dairy industry.

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## OP-21 Functional and Nutritional Properties of Gluten and Its Impact on Human Health

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Wheat and wheat-derived foods have become an indispensable part of the human diet over the 10,000 years and, today, it is widely consumed in many processed food products. In addition to being a source of energy, wheat is also rich in fiber, proteins, and minor components, such as phytochemicals, vitamins, lipids, minerals, and other nutritional elements.<sup>1,2</sup> Gluten proteins in wheat contribute to the unique baking quality by imparting water absorption capacity, stickiness, viscosity, and elasticity to the dough.<sup>3</sup> Apart from these unique properties, gluten proteins trigger allergic, immune system, or non-immune system-related disorders. One of the most well-known gluten-related disorders is coeliac disease. Diarrhea, fatigue, headaches, and an itchy skin rash are common symptoms of this disease. Consumption of gluten results in damage to the small intestine and long time exposure increases the risk of developing or worsening malnutrition, infertility, anemia, and osteoporosis. Other gluten-related disorders also have similar symptoms.<sup>4,5</sup> Although these diseases are rare, there has been a significant increase in the adoption of gluten-free products in recent years.<sup>5</sup> This presentation summarizes the functional and nutritional features of gluten and explains its role in triggering gluten-related disorders, to a greater extent, coeliac disease. We also discuss the increasing demand for gluten avoidance trends and highlight the possible solutions from the chemistry and food industry point of view.

**Keywords:** Gluten; gluten-related disorders.

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## OP-22 The Aroma Compounds of *Vitex*, *Helianthus*, and *Tamarix* Honey Collected from Kazakhstan

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Kazakhstan is rich in honey plants. There are about a thousand species of them. In this regard, interest in Kazakhstan honey is present in all countries, from east to west. However, this domestic honey needs to be studied more. This prevents Kazakhstan, as a manufacturer of bee products, from entering the world market. To study their quality, it is necessary to determine their physicochemical properties, composition and activity using various scientific methods. *Vitex*, *Helianthus*, and *Tamarix* honey samples were collected from three regions of Kazakhstan, such as East Kazakhstan (Oskemen), Zhambyl (T. Ryskulov), Akmola (Kokshetau). Their pollen analyses and physicochemical properties were performed according to IHC methods. The volatile compounds were also determined using head space-GC-MS instruments [1]. The pollen analysis, provided that 22-D-1 was *Vitex agnus castus*, while 22-D-2, 22-D-4 *Helianthus annuus*, and 22-D-3, 22-D-5 *Tamarix* (Tamariceae). As a result, 32 aromatic compounds were identified. The major compounds identified are Hotrienol, Carvone, Benzaldehyde, Benzene acetaldehyde, etc. Moreover, limonene, linalyloxide, *trans*-4-metyl benzaldehyde, 1-terpineol, 1,3,8-*p*-menthatriene,  $\beta$ -terpineol, nereloxide, chrysanthemum, pinacarvone, beta-citronellal, *cis*-carveol, *p*-cymene-8-ol,  $\alpha$ -terpineol, satanal, myrtenal, *trans*-3-decen-1-ol, eucarvone, camphene, cuminal, *cis*-*p*-mentha-2,8-dien-1-ol, cinnamaldehyde, phellandrene,  $\alpha$ -terpinen-7-al, thymol,  $\alpha$ -terpinyl acetate, cinnamyl acetate were also detected in the honey samples as volatile compounds. These compounds may be used to detect the originality of Kazakhstan honey.

**Keywords:** Aroma; honey; GC-MS.

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## OP-23 A New Method to Determine the Foreign $\alpha$ -Amylases in Honey

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$\alpha$ -Amylase is an enzyme that determines the diastase number in honey. According to the Turkish Food Codex Honey Communique, the number of honey diastases should be 8 and above. The amount of  $\alpha$ -amylase in authentic or raw honey exceeds 8 diastase numbers. However, if the honey does not preserve its freshness, if it was stored in bad conditions or heated to high temperatures, or alternatively, if honey is obtained by feeding the bee with inverted sugars, the diastase number is generally below 8. According to the Turkish Food Codex Honey Communique, honey is unsuitable in these cases. Therefore,  $\alpha$ -amylase is added externally to ensure compliance with the communique by malicious people. In addition, starch-based syrups are generally converted to a bee food that bees can use via hydrolysis either chemically with inorganic acids or by  $\alpha$ -amylase enzyme of plant or bacterial origin. If honey is obtained by giving this hydrolysate to the bee, foreign  $\alpha$ -amylase is transferred to the honey as  $\alpha$ -amylase. In the last case, the bee may convert the foreign  $\alpha$ -amylase to  $\beta/\gamma$ -amylase. In both cases, honey is adulterous. Because according to the Turkish Food Honey Communique, Article 5, paragraph 1, subparagraph (a), no external food component or any external substance is added to honey. Fadabas and Shade Tests recommended in IHC methods are insufficient to detect foreign  $\alpha$ -amylase. Therefore, an inexpensive method was developed in the Natural Products Research Laboratory of Muğla Sıtkı Koçman University to determine the foreign  $\alpha$ -amylase, which is a sought-after criterion in honey exported to Europe.

The method is based on determining the molecular weight of  $\alpha$ -amylase using HPLC-GPC-RI. For this purpose,  $\alpha$ -amylase was separated from honey using the cut-off filters technique, and average molecular weights were successfully determined with standardized GPC columns. The study was confirmed using western blot analyses as well as antibodies. Since it will be an analysis parameter that should be done in honey primarily exported, the newly developed method will soon be able to perform in accredited laboratories under the Ministry of Agriculture and Forestry.

Of course, with the increasing technology, the development of cheap and practical adulteration detection methods can often be used by companies employed in the honey trade to

ensure the safety and quality of honey. The quality control department can also use these methods to conduct extensive inspections of honey samples on a regular basis to prevent fake honey from entering the market.

**Keywords:** Honey; adulteration; diastase; foreign  $\alpha$ -amylase; HPLC-RID.

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## OP-24 Quantification of Blending of Olive Oils with Corn Oils by Fatty Acid and Triacylglycerol Profiles

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Extra virgin olive oil (EVOO) is usually more expensive than other vegetable oils, which makes it a candidate for adulteration with other cheaper oils. In this context, gas chromatography (GC) and high-pressure liquid chromatography (HPLC) were used to determine the level of corn oil (1-10%) in two EVOO samples obtain from different provinces in Türkiye. The oil mixtures were evaluated in terms of fatty acid and triglyceride (TAG) compositions. Changes in the oleic and linoleic acid contents, and  $\Sigma$ MUFA,  $\Sigma$ PUFA, DBI, and BAPE values in the mixtures have shown the adulteration at a rate of 1%. Iodine number (IV) was also able to detect the adulteration at 1 and 2.5% depending on the olive oil samples. The adulteration was detected with the increases in LLL, OOL+PoOL, OOLn+PoPoO contents at 1%, 5% and 2.5% levels, respectively, and with the decrease in OOO at 7.5% level. Increases in  $\Sigma$ ECN42 and  $\Delta$ ECN42 and decreases in the ratio of bilateral totals of ECN and  $\Sigma$ (ECN44+46+48) to LLL were also able to determine the adulteration at 1%.

As a result, the adulteration of olive oils with corn oil could be detected at different rates with different parameters. However, it is quite difficult to determine whether any olive oil obtained from the market is adulterated with corn oil through these parameters. Because, the fatty acid and TAG profiles and quantities of olive oil show great differences according to genetics, ripening, harvest time, geographical characteristics, agricultural applications and oil production method. Due to the effects of these factors, a wide range of fatty acids and TAG ratios are given in both national and international olive oil standards. Therefore, this study suggests that olive oils with a consistent database from a particular variety in different regions, at different ripeness and harvest times will be useful if the minimum and maximum values of fatty acids and TAG are determined in advance.

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**Keywords:** Olive oil; corn oil; fatty acid.

## OP-25 A New Approach to Chemistry: Bibliometric and Altmetric Analyses in The Functional Foods

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A functional food might be natural or contain one or more specified ingredients that have a functional impact on the consumer's health and well-being. One of the areas of the food and nutrition sciences that is now being researched the most and promoted the most is functional foods.<sup>1</sup> A research article's effect can be evaluated in a number of ways. Journal impact factors and citation counts were the traditional metrics used by bibliometrics to gauge an article's influence on academia. To supplement bibliometrics and show the direct social impact of scientific publications, altmetrics were developed.<sup>3</sup>

The goal of this study is to guide researchers in functional foods by evaluating the 50 most cited articles in terms of bibliometric analysis, Altmetric scores, and dimension badges and also aims to give a thorough overview of the functional foods in the context of future research goals

Total citations of the top 50 (T<sub>50</sub>) articles ranged from 552–1792 and the AASs of top 50 (T<sub>50</sub>) articles ranged from 0–524. The most cited article has a very low altmetric score. When T<sub>50</sub> articles are examined according to the distribution of the research area 'Food Science Technology' constitute the subject 24 of 50 articles. Twitter is the most popular social media network for 50 mentioning articles

Although it is not always the only criterion for an article's quality, the number of citations does reflect the article's importance and scientific contribution. It might be suggested that bibliometric and altmetric evaluations be seen as complementing one another.

**Keywords:** Bibliometric analyses; altmetric analyses.

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## OP-26 Microencapsulation of Yeast Cells and Its Potential Usage as A Post- Harvest Biocontrol Agent For Citrus Storage

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Türkiye is one of the 10 largest producers of citrus fruits in the world in terms of cultivation. The formation of residues of synthetic pesticides, the prohibition of active substances due to restrictions, and the fact that all products are imported substitutes create a need for the development of domestic and natural alternatives [1]. Research has shown that while antagonist yeasts prevent the reproduction of harmful microorganisms by creating competition on the fruit, they also stimulate the immune system of the fruit. In addition, yeast cells, which have been widely produced in the food industry for many years, have much higher production on a large scale and standardization of activity compared to bacterial cells. Due to these properties, it is stated in the literature that antagonist yeasts are more advantageous than bacteria.

The aim of this project is to encapsulate the yeast species that we have proven its antifungal activity against *Penicillium digitatum* (green mold) and *Penicillium italicum* (blue mold) fungus, which cause storage disease in citrus, by spray drying, and to develop the formulation of a biopesticide in the form of Wettable Powder (WP). Lab-scale production, formulation studies and post-harvest in vivo trials of the yeast isolated from citrus fruits and determined as *Wickerhamomyces anomalus* in species determination have been conducted. Spray drying is a method of rapid drying of a liquid or slurry with a hot gas. A dry powder is obtained as the final product. It is an advantageous method to obtain a consistent particle size distribution [2]. The most successfully observed materials in the literature for the encapsulation of yeasts by spray drying method are corn starch and trehalose for carbohydrates, sodium alginate for gums and whey for proteins, and these materials were used in this research. Microencapsulated yeasts are compared in terms of biological activity, viability and formulation stability.

The post-harvest biological activity of the obtained powder formulations against storage rot in citrus was studied on fruits and it is thought that it can be used as biopesticides according to the results obtained.

**Keywords:** Yeast cells; microencapsulation; citrus fruits.

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## OP-27 The Cytotoxic Activity of *Infundibulicybe geotropa* Against Prostate (LnCaP) Cancer Cell Lines: The Commercial Edible Mushroom

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Medicinal mushrooms are sources of polysaccharides and triterpenoids having anti-cancer and immunomodulatory properties. Lectins, polysaccharides, polysaccharide-peptides, polysaccharide-protein complexes, triterpenoids and phenolic substances have been isolated from mushroom species [1]. It is known that Krestin, produced from mushrooms in Japan, takes place 25% of the total cancer drug market and contributes billions of dollars to Japan [2]. The literature says that compounds obtained from mushrooms show various bio-activities. Recently, some bioactive compounds isolated from mushrooms were mentioned in the literature and have cytotoxic and immunomodulatory effects. This research aims to prepare petroleum ether extract from *Infundibulicybe geotropa* (Bull.) Harmaja. to determine the cytotoxic activity against prostate (LnCaP) cancer cell lines using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) method. The results were given as EC<sub>50</sub> values. Since the petroleum ether extract indicated cytotoxic activity, we planned an activity-guided fractionation. In future, bioactive compounds will be isolated and elucidated by an activity-guided fractionation to develop potential cancer therapeutics.

**Keywords:** *Infundibulicybe geotropa*; cytotoxic activity; prostate (LnCaP) cancer cell lines.

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## OP-28 Encapsulation of Bioactive Ingredients by Alginate Beads Method

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Bioactive components in foods have an important economic value due to their usage in many industries. However, during the processing and storage of bioactive components, they decrease or lose their effectiveness by turning into other substances. Therefore, different encapsulation techniques have been developed to increase the storage stability of bioactive components. Encapsulation of bioactive components is carried out by applying different techniques such as spray drying, spray cooling or freezing, fluidized bed coating, liposome entrapment, alginate beads and coacervation.

Alginate bead method is the most widely used encapsulation method in the microencapsulation technique because of its biodegradability, nontoxicity and mild gelling properties. Alginate polymer consists of a linear long homopolymeric blocks of (1–4)-linked  $\beta$ -D-mannuronate and  $\alpha$ -L-guluronate residues (1). One calcium ion binds to four G units and forms a hexagonal lattice which is known as an “egg-box” gel structure (2). It is reported that encapsulation efficiency of Ca-alginate beads effect different factors such as capsule size, capsule shape, mass transport properties, biocompatibility, swelling capacity, solubility, surface morphology and mechanical and chemical stability. Small bead size in alginate beads method increases the efficiency and performance of encapsulation due to diffusion limitation. The sphericity of the beads is highly effective on mechanical and chemical stability. There are several studies on the encapsulation of different bioactive components by the alginate bead method such as riboflavin (3), thyme (4),  $\beta$ -carotene(5).Therefore, it can be said that the alginate bead method provides successful encapsulation efficiency and controlled release of bioactive compounds and can be performed for different active substances.

**Keywords:** Encapsulation; alginate beads method.

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## OP-29 Determination of Alantolactone And Isoalantolactone in *Inula Helenium* L. Root with Liquid Chromatography Tandem Mass Spectrometry

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*Inula helenium* L. is a medicinal plant officially listed in some European pharmacopoeias. It has been demonstrated that *Inula helenium* L. root extracts are rich in eudesmane-type sesquiterpene lactones, mainly Alantolactone and Isoalantolactone that have recently attracted much attention due to their pharmacological properties, including hepatoprotective, antiinflammatory, antitumor, antibacterial, antidematophytic, antifungal and anticancer activities<sup>1</sup>. The aim of this study is to develop reliable analytical method to detect alantolactone and isoalantolactone in *Inula helenium* L. roots. The method includes extraction of alantolactone and isoalantolactone with ethanol and analysing with LC-MS/MS. In House validation of analytical method was performed by carrying out, linearity, limit of detection, limit of quantification, precision and recovery.

**Keywords:** *Inula Helenium*; alantolactone; isoalantolactone.

- [1] X.F. Chi, H.L. Yue, X.H. Zhao and F.Z. Hu, (2016). Obtaining alantolactone and isoalantolactone from *Inula racemosa* Hook.f. by optimized supercritical fluid extraction, *Ind. Crops Prod.*, **79**, 63–69.  
<https://doi.org/10.1016/j.indcrop.2015.10.025>



## OP-30 Voltammetric Determination of Mepanipyrim Fungicide Using Silver Nanoparticle Modified Carbon Paste Electrode

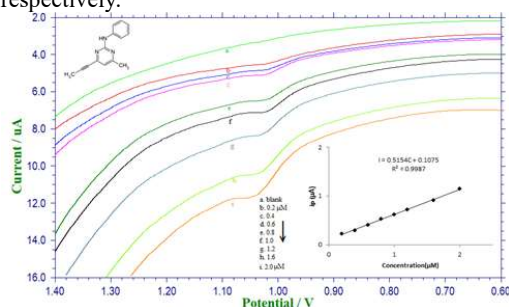
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Fungicides are widely used in agriculture to destroy fungi that are harmful to vegetables and plants in many countries, as well as to protect fruits<sup>1</sup>. Mepanipyrim (*N*-[4-methyl-6-(prop-1-ynyl) pyrimidin-2-yl]aniline) is a fungicide used to control a wide range of fungal diseases mainly strawberries, grapes, blackberries, raspberries, tomatoes, apples, pears, cucumber, peppers. However, sensitive and selective method needs for the detection of mepanipyrim in food samples due to their toxicological and carcinogenic properties<sup>2</sup>. In this study, the electrochemical behavior of Mepanipyrim was examined using cyclic voltammetric (CV) technique. The electro-oxidation peak potential of mepanipyrim fungicide was recorded at +1092 mV (vs. Ag/AgCl. and pH 3.0 Britton-Robinson buffer solution). Afterward, square wave voltammetry (SWV) technique, which is a very fast and sensitive method, was used for the quantitative determination of mepanipyrim. In this sense, significant parameters such as pH, frequency and step potential were optimized. Calibration graph studies were performed under the stated optimum conditions and voltammograms were recorded (Fig.1). The limit of detection (LOD) and the limit of determination (LOQ) were found to be 0.0457  $\mu$ M and 0.1534  $\mu$ M, respectively.



would like to thank the Turkish Higher Education Commission (YÖK) for supporting the YÖK 100/2000 PhD Program.

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### OP-32 Microwave-assisted Extraction Optimization of Sesquiterpene Lactones from *Inula Helenium* Roots

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*Inula helenium* L. is a medicinal plant that is officially listed in some European pharmacopoeias, and its root extracts are rich in eudesmane-type sesquiterpene lactones such as alantolactone (AL) and isovalantolactone (IAL) which have recently received much attention due to their pharmacological properties, including hepatoprotective, anti-inflammatory, antitumor, antibacterial, antiparasitic, antifungal and anticancer properties<sup>1</sup>. Based on this information, the efficiency of the extraction technique is very important on recovering of bioactive sesquiterpene lactones AL and IAL from *Inula helenium* roots. For this purpose, the current study focused on the extraction of sesquiterpene lactones using microwave-assisted approach and optimization of the extraction process by the Response Surface Methodology-Face Centered Central Composite Design (RSM- FCCCD). As a result, the highest AL (54.99 mg/g) and IAL yields (48.40 mg/g) were obtained at MAE with application of liquid: solid ratio (L:S) of 30:1(mL/mg), EtOH:water ratio of 100:0, exposure time of 5 min and exposure power of 300 W.

**Keywords:** *Inula Helenium*; microwave-assisted extraction; alantolactone (AL); isovalantolactone.

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### OP-33 Development of New Generation Fast Soluble Gelling Agents

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In order to solve the global warming problem, which is a great threat to the world today, countries and companies are making many attempts to reduce carbon emissions. The efficient use of energy resources is one of the most important points that companies pay attention to both in their production processes and in their final products. The main purpose of the presented study is to develop a new generation gelling agent product and production method, which has the feature of rapidly dissolving in cold water for carbon emission reduction and sustainable production and saves time and energy by eliminating the preheating process step in the use of commercial gelatin. With this aim, the food gelatin supplied from Halavet Gıda was dried by spray and drum dryer both alone and mixed with dextrose, maltodextrin, and collagen hydrolysate in certain proportions. Within the scope of new generation gelling agent formulation studies, gelatin with a particle size of 210 µm in the range of 180-300 blooms was used. For the experiments, an experimental design was created using the Minitab 17 program over the dependent variables of gelatin concentration, gelatin bloom value and auxiliary content concentration (collagen hydrolysate, maltodextrin, and dextrose), and trials were carried out. During the drying process, the polymer chains in the gelatin structure quickly transform from a crystalline structure to an amorphous structure, which allows the gelatin to dissolve in cold water without the need for heating. After drying, the properties of the samples such as crystallinity, moisture content, bulk density, and viscosity were determined via characterization tests, and the gelation temperatures and times of the most suitable samples were examined. Rheological analyzes were performed to characterize the gelation behavior of gelatin. To determine the gelling temperature, temperature scanning and the desired viscosity analysis of the gelatin solution were performed. In addition, the particle size of the dried gelatin is also important for both rapid dissolution and prevention of aggregation. After drying, the particle sizes of the samples were also measured, and the effect of particle size on the dissolution behavior was examined.

**Keywords:** Gelling agents.

## OP-34 Chicory (*Cichorium intybus* L.) Cultivation and Inulin Production

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Chicory (*Cichorium intybus* L.) is a biennial herb known as an industrial source of inulin<sup>1</sup>. Chicory farming is similar to sugar beet farming. The process of making inulin from chicory is similar to that of making sugar from sugar beets. The usage areas of inulin cover a wide range from food production to pharmaceutical production. It is used in many fields such as animal breeding, medicine, food, cosmetics and it is becoming a product that is increasing day by day. A chicory experiment was established in the Kayseri Sugar Factory Resarch and Development Center field trial area, which included three different fertilization plans in the cultivated area. In the fertilizer selection, 12-20-10 formulation base fertilizer used by Kayseri Sugar in general production was used. Ammonium sulfate was used as top fertilizer. Moisture, ash and protein contents of chicory plant were determined as 68.8±1.22%, 4.58±0.22% and 4.57±0.23%, respectively. The amount of inulin in chicory was determined by HPLC-RID method as 31.33 ± 0.6(g/100g)<sup>2</sup>. Obtaining inulin from the chicory plant essentially involves three stage. The first phase is extraction, the second is inulin purification and the last phase is drying the inulin syrup<sup>3</sup>. Commercially available inulins were purchase from the market and HPLC was compared. Inulin obtained in the laboratory has been found to be similar to commercially available. inulin In addition to this, liquid productions with various pH and brix values were made. Eventually, a variety of drying experiments were conducted. The goal of this study is to produce inulin from chicory plants and transform it into a finished product from seed to plate.

**Keywords:** *Cichorium intybus*; HPLC-RID.

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## OP-35 Reduction of Gluten in Cereal Foods Without Substitution of The Problem Ingredient

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In recent years, various nutritional trends have been adopted by consumers around the world in response to health concerns. The gluten-free diet is one of these trends and requires avoiding consumption of wheat and other closely related cereals in any form as whole, as an ingredient in processed foods. For some consumers the acceptable threshold levels of exposure to gluten are very low. Whereas, there are healthy individuals (i.e. those without a prescribed diagnosis of gluten intolerance, celiac or wheat allergies) that may choose to consume a diet low in gluten. Aside the fact that gluten related conditions may be on the rise, the mindful choices of regular consumers are causing steep increases in demand for gluten-free/gluten-reduced alternative foods. Substitution of the gluten containing component with an alternative cereal or pseudocereal ingredient is the most commonly used method to obtain a gluten-free product. However, this commonly leads to inadequacies in the nutritional profile and causes deviances from the original perceptual qualities. In most gluten free foods where the component of interest is substituted with starch or starch rich bulk ingredient, this results in high-calorie foods with low dietary fiber and often rich in fat, with poor vitamin and mineral composition. Moreover, these foods are sold at much higher prices than their gluten-containing counterparts<sup>1</sup>.

On the other hand, there are some studies providing gluten degradation using thermomechanical food processing technologies such as extrusion, enzyme applications such as germination, fungal proteases, microbial transglutaminase, prolyl endopeptidase (PEP) and also lactic acid bacteria and sourdough biotechnology<sup>2-3</sup>. In these studies, the potentials for developing more reliable products are investigated by providing partial or complete hydrolysis of both gluten from contamination in gluten-free cereals and toxic epitopes in gluten-containing cereals. In recent years, various attempts have been made to reduce the immunogenic gluten sequences while maintaining the technological properties of wheat.

The objective of the present review is to present an overview of the methodologies utilized for gluten reduction in foods that does not involve exclusion of the gluten containing ingredient. To this end, treatment strategies for gluten reduction in sourdough and other cereal foods are discussed.

**Keywords:** Gluten; cereal foods.

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### OP-36 Label Free Quantitation of Defensin-1 in Honey from Different Botanical Origins: Versatile Microproteomic Workflow for Absolute Quantification of Antimicrobial Peptide

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Honeydew honey is progressively valued thanks to its pronounced potent biological properties including antibacterial, antibiofilm, antioxidant, as well as wound healing activity<sup>1,2</sup>. The antibacterial and antibiofilm activity of honeydew honey is comparable to manuka honey, which is currently used as medical-grade honey in clinical applications. However, the underlying mechanisms and compounds responsible for the strong antibacterial and antibiofilm activity of honeydew honey has not been fully elucidated. Well-characterized major components; hydrogen peroxide and the cationic antibacterial peptide honeybee defensin-1 (Def-1) were identified as antibacterial substances. In this study we aimed to evaluate the content of Def-1 in honeys of different botanical origins (pine, blossom, citrus, chesnut honey and manuka and Revamil as medical grade honey) with the multiple reaction monitoring (MRM)-based targeted proteomic approaches. Honey proteins were first extracted by chemical precipitation with trichloroacetic acid, subjected to tryptic digest, and analyzed using LC-MRM-MS method. The honeybee Def-1 protein sequence was retrieved from the UniProt Knowledgebase and imported to Skyline software to identify suitable MRM transitions. *In silico* digestion yielded six peptides representing honeybee Def-1. These were used initially to acquire MRM data from a pooled sample of all the honey protein extracts. The results from these analyses were used to refine the mass transitions and scheduled retention times. Three of these peptides were selected as signature peptides of Def-1 that yielded intense peaks and were fully tryptic, with no variable modifications or missed cleavages. The results demonstrated that pine honey contains relatively high levels of bee Def-1 than other types and Def-1 levels increased in correlation with the honeydew honey elements content. Our novel findings suggested that pine honey may be potential for being medical

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grade honey with the high levels of Def-1 and therefore further studies are needed to investigate the therapeutic effects of Def-1.

**Keywords:** Honey; antimicrobial peptide.

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### OP-37 Elucidating The False Positive Tendency at AOAC 998.12 C-4 Sugar Test For Pine Honey Samples: Modified Sample Preparation Method For Accurate $\Delta^{13}C$ Measurement of Honey Proteome

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The majority of the authentic pine honey samples fail from C-4% sugar test [1]. Pine honey is generally characterized by small-sized insoluble honeydew elements, and these can form an appreciable amount of precipitate during protein flocculation [2]. These substances may shift the protein-centric  $\delta^{13}C$  ( $^{13}C/^{12}C$ ) values inaccurately. In this study, honey proteins were isolated, enriched, and cleaned-up prior to flocculation by applying the optimized and validated ultrafiltration method. Authentic honeys were analyzed along with adulterated samples using both AOAC 998.12 and novel protocol. When the interfering substances were eliminated, most of the samples, which were interpreted as adulterated according to the AOAC's method previously, were identified as authentic. It has been proven that inconsistent protein measurements may cause false positivity. These findings revealed that the developed method could correct the artificially high C-4% results and the proposed modification will pave the way for increasing the overall reliability of the test.

**Keywords:** Pine honey; C-4 sugar test.

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## OP-38 Development of Innovative Bio-Preservatives As an Alternative to Potassium Sorbate

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The changing lifestyles of consumers, their desire for healthier and longer life have increased the demand for foods with beneficial effects and created barriers against synthetic preservatives. Studies in literature show that some additives used in food products cause long-term damage to human health. Studies have shown that 0.03-0.01 % of the European population is sensitive to food additives. In addition, the fact that food additives are not sufficiently protective for some foods and microorganisms causes serious economic losses. In line with all these data, many organizations have started studies in order to switch to “clean label or E-free label” applications by reducing/removing the chemical additives they use in their products.

In this study, it is aimed to develop natural preservatives that can be used as an alternative to potassium sorbate, a food additive. In this direction, it is aimed to obtain bioactive extracts from different natural sources and to examine their antifungal effects in margarine as an exemplary food application. As an antifungal preservative; the synergistic activities of products such as orange, lemon, bergamot, propolis, pomegranate peel, cinnamon root, apple peel, carrot, mint, garlic, clove, lamb's ear, sage, ginger, St. John's Wort, thyme, onion peel, olive leaf were investigated. The obtained bioactive extracts were microencapsulated with chitosan in order to mask the taste and odor, to stabilize them in the product and to prevent the volatile components from volatilizing. Then, sensory and shelf life properties were investigated by using it instead of potassium sorbate in margarine trials.

Results show that synergistic combinations containing zahter, cinnamon, onion peel, cloves are approximately 15 times more effective than potassium sorbate. Combinations with antifungal activity also showed antioxidative activities. When evaluated in terms of these properties, it is thought that microencapsulated herbal extracts, which are similar to potassium sorbate although they are herbal, have great commercial potential.

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Biotechnology, Batı Akdeniz Agricultural Research Institute and Central Research Institute Of Food And Feed Control.

**Keywords:** Potassium sorbate.

## OP-39 Investigation of The Colostrum Components and Their Effects on The Immune System

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Colostrum is the first milk produced by mammals after birth, secreted from the mammary lobes [1]. It differs from milk in terms of its structure and properties [3]. Colostrum is a very important nutrient for the transmission of immunoglobulins that provide maternal immunity from the mother to the offspring. It is the most important factor that ensures the survival and health of the offspring in the neonatal period [1,3]. Antibodies in the colostrum have protective properties against some diseases during the developmental period of the offspring [1]. Colostrum has a higher density on the first day and gradually decreases in the 2nd and 3rd days and turns into normal milk consistency. It is very important that the colostrum is drunk by the pup in the first 24 hours[1]. In addition to being a very valuable nutrient, it increases intestinal peristalsis and causes meconium to be thrown out. Mild diarrhea is a temporary and normal reaction and will resolve spontaneously (3). When the components of colostrum are examined, proteins, peptits, immunoglobulins (IgA, IgD, IgE, IgG and IgM) [1,4], vitamins (A, D, E, B12), minerals, oils, glycans are abundant [1,2]. Immunoglobulins are effective in both the treatment and prevention of viral and bacterial infections, allergies. It directly attacks the infectious agents and neutralizes the microbes. It is an important food supplement that contains rich bioactive molecules and contains very valuable nutrients for human health[3]. In terms of industrial production possibilities and functional food properties, it can be offered for consumption as fresh colostrum and processed powdered products as a food supplement, in terms of its positive effects on the immune system [4]. It is considered as an important product in the fight against cancer in humans and many scientific researches are carried out in this field [2]. It is important to offer bovine and buffalo colostrum as a functional product to support the treatment of diseases and to develop products for this purpose.

**Keywords:** Colostrum; functional food; immune system.

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### OP-41 Elemental Analysis and Health Risk Assessment of Some Commercial Almond and Hazelnut Samples Consumed in Türkiye

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Almonds and hazelnuts are among the most widely grown and traded nuts in the world. They are a good source of nutrients in terms of minerals<sup>1</sup>. Although they are good food sources, they may contain various heavy metals and toxic elements depending on their region, soil structure and production. In this study, mineral element composition and potentially toxic element levels of five commercial almond and five commercial hazelnut samples in Türkiye were determined with inductively coupled plasma mass spectrometry (ICP-MS) after microwave assisted acid digestion<sup>2</sup>.

The elemental composition of almonds and hazelnuts were in the following ranges respectively (minimum-maximum, mg kg<sup>-1</sup> dried almonds and hazelnuts); Mn (manganese): 21.60-31.44; 38.03-103.33, Fe (Iron): 41.45-55.20; 33.87-40.57, Zn (zinc): 32.43-42.53; 21.12-31.89, Se (selenium): 0.04-0.06; 0.02-0.13, Cr (chromium): 0.04-0.28; 0.03-0.24, Cu (copper): 10.66-13.11; 16.39-21.84, Mg (magnesium): 2551.07-2551.58; 1685.38-2099.46, Ca (calcium): 1724.67-2714.39; 1305.75-1663.71, K (potassium): 7823.90-8510.41; 6755.67-9268.84 Na (sodium): 13.39-2496.07; 5.42-30.57, Pb (lead): 0.02-0.06; 0.02-0.06, Cd (cadmium): 0.02-0.04; 0.02-0.04, Ni (nickel): 1.00-1.49; 1.54-5.19 and As (arsenic): <0.001-0.008; <0.001-0.005. These findings were used to calculate recommended daily intake (RDA), target hazard coefficients (THQ), hazard index, and carcinogenic risk (CR) values for hazelnut samples<sup>2-3</sup>. These nuts were found to be rich in Cu, Fe, Mn, Mg and Zn. Considering the THQ values, it has been determined that almonds and hazelnuts are safe for consumption by both genders. According to the carcinogen risk calculations, all of the samples examined in the present study are within safe limits in terms of As and Cd and Pb. However, while the carcinogenic risk for Cr is moderate, it has been categorized as moderate to high risk, especially for Ni. The carcinogenic risk was calculated within the range of  $6.55 \times 10^{-5}$  –  $7.12 \times 10^{-5}$  for Cr and  $8.82 \times 10^{-5}$  –  $4.55 \times 10^{-5}$  for Ni. In the absence of any natural pollution and

contamination from production, it was concluded that the biggest risk factor in these nuts may be Ni.

**Keywords:** Almond; hazelnut.

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### OP-42 Determination of The Water-Extractable Fluoride Content of Packed Teas with Brewing of Türk Style

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Tea (*Camellia sinensis*), include such as white, yellow, oolong, green, black and pu-erh, are produced depending on the degree of oxidation/fermentation process. Black tea is brought forth completely fermentation of tea leaves, catalyzed by the enzyme polyphenol oxidase. Black tea is not only a popular beverage but also an antioxidant agent present in everyday life. In general, there is no universally accepted method for the preparation and presentation of tea. While green tea is preferred in some countries, disposable tea bags are common in other countries. It is common to add a certain amount of milk to tea in another, mint flavor is quite common in the other.

The method of preparation and presentation of the brewed tea may affect the concentration of bioactive compounds in the tea liquor that would ultimately be consumed. The fluorine is the natural content of black tea and may reach very high levels according to the geography where the tea plant is grown. Therefore, there are potential concerns about tea, which makes up the largest part of cumulative fluoride exposure, very widespread and high consumption in Türkiye. There is a dilemma regarding fluoride exposure. While excessive fluoride intake causes fluorosis, adequate intake contributes to dental and bone health. In terms of bone and dental health, tea can be recommended as a measurable and natural source for systemic fluoride intake.

In this study, of 43 granular black tea samples purchased from supermarkets in Ankara and fluorine content were determined



according to AOAC Official Method 975.04. The fluoride ion content of the liquors of the teas brewed according to the Türk tea preparation method from these samples was determined according to EPA Method 9214. In addition, the percentage extraction rate was determined. In addition, regression analysis was performed to determine the relationship between fluoride contents of granule and brewed tea samples.

**Keywords:** Fluorine; Granular black tea; tea liquor; regression analysis.

## OP-48 Phenolics and Antioxidant Activity of Two *Sideritis* Species Endemic to Türkiye

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The genus *Sideritis* L. mainly distributed the Mediterranean basin<sup>1</sup>. Spain is the first country with 89 *Sideritis* species and Türkiye is the 2<sup>nd</sup> country in the world both are the gene centers having maximum species of the genus<sup>2</sup>. In this study, the phenolic component and antioxidant activity of tea prepared from two endemic *Sideritis* species; *Sideritis argyrea* P.H. Davis (Eşek çayı, Acı çay) ve *S. congesta* P.H. Davis & Hub. Mor. (Anamur adaçayı, Yayla çayı, Dağ çayı); were investigated. The antioxidant capacity of the teas, prepared by infusion, was determined by DPPH free radical scavenging activity,  $\beta$ -carotene linoleic acid assays, and CUPRAC assays<sup>3</sup>. The phenolic compositions of the species were analyzed using Liquid chromatography–mass spectrometry (LC-MS/MS) techniques. Both plant species were found to be rich in phenolic acids, and fumaric acid (331,87 $\pm$ 23,01 mg/kg) was the main component of *S. argyrea* tea, while chlorogenic acid (297,25 $\pm$ 41,16 mg/kg) was determined as the main component of *S. congesta*. The antioxidant activity of the teas prepared from *Sideritis* species were showed moderate activity. As a result, teas rich in fumaric acid and chlorogenic acid showed high antioxidant activity. This is due to the free radical scavenging properties of these compounds.

**Keywords:** *Sideritis*; phenolics; antioxidant activity.

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## OP-49 Comparison of CMC From Sugar Beet Cellulose and Commercial CMC on A Tomato Sauce Model

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Currently, the disposal of lignocellulosic wastes, which are agricultural by-products, is a problem<sup>1</sup>. This is crucial for the conversion of value-added product byproducts. A by-product of the manufacturing of sugar that is well known is sugar beet pulp<sup>2</sup>. Because of its cellulose content, sugar beet pulp is recognized as a rich source of cellulose. The most common cellulose derivative is carboxymethyl cellulose (CMC), which is produced by cellulose etherification<sup>3</sup>. In this study produced CMC (BCMC) from sugar beet pulp and compared its effects to those of commercial CMC (CCMC) using a tomato sauce model. The BCMC used to make tomato sauce had a DS value of 0.53 and a purity of 98%. There was no significant difference between tomato sauce made with BCMC and CCMC in terms of pH, protein, aw value, or color (L\*, a\*, and b\*) characteristics (p<0.05). The moisture and ash content of tomato sauce made with BCMC were found to be 85.65% and 6.67%, respectively. These values are statistically different from tomato sauce prepared with CCMC. The tomato sauces produced were evaluated for their rheological characteristics, namely apparent viscosity, consistency coefficient, flow behavior index, storage module, and loss module. The results showed that CCMC addition to tomato sauce had a greater rheological effect than BCMC. The color, appearance, consistency, spreadability, aftertaste and general acceptability of tomato sauces were determined by sensory analysis. Although there was a difference in consistency, spreadability, aftertaste, and general acceptability between BCMC and CCMC tomato sauces (p<0.05), there was no statistically significant difference in color and appearance (p>0.05).

**Keywords:** Sugar beet cellulose; tomato sauce.

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## OP-50 Antioxidant Activity of Buttermilk Powder Hydrolysates: Impacts of Enzyme and Time of Hydrolysis

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Dairy production is a branch of industry introducing a wide variety of products meanwhile a significant amount of waste material is generated. Due to the diversity of the products, conversion of the wastes to by-products has critical importance for this industry. Buttermilk, which is one of the main outputs of butter production, is a remarkable by-product that should be evaluated due to its unique chemical composition and nutritive value. Buttermilk powder (BMP), mostly obtained after pulverizing by spray drying, is commonly used in food formulations as a texture improver, emulsifier and stabilizer. Since BMP has also been mentioned to have potent antioxidant effects, enzymatic hydrolysis is an appropriate way to reveal these activities by obtaining BMP hydrolysates rich in biopeptides. In this context, in the present work, it was objected to hydrolyze BMP using different commercial enzymes for different durations and to examine the antioxidant activity.

BMP hydrolysates were produced by using three different proteases in four different combinations as follows: A: Alcalase<sup>®</sup>, AN: Alcalase<sup>®</sup> and Neutrase<sup>®</sup>, AP: Alcalase<sup>®</sup> and Protamex<sup>®</sup>, ANP: Alcalase<sup>®</sup>, Neutrase<sup>®</sup> and Protamex<sup>®</sup>. The hydrolysis procedure was carried out during 2, 4 and 6 h. The hydrolysates obtained in A treatment yielded the lowest degree of hydrolysis (DH) while the hydrolysates obtained either in AN or ANP combinations yielded the highest DH among treatments. In all treatments, time of hydrolysis was effective to increase DH. The highest 1,1-Diphenyl-2-Picrylhydrazyl (DPPH) radical scavenging activity was recorded in AN samples that were hydrolysed for 6 h. Except for AP group, 6 h of hydrolysis significantly increased DPPH radical scavenging activities of all treatments compared with 2 or 4 h of hydrolysis. The highest Ferric-Reducing Antioxidant Power (FRAP) values belonged to AN and ANP samples (specifically hydrolysed for 6 h), whereas the lowest FRAP values belong to A samples. In A and AN samples, 6 h of hydrolysis resulted in higher FRAP values compared with 2 of hydrolysis. 2,2'-Azino-Bis(3-Ethylbenzothiazoline-6-Sulfonic Acid) (ABTS) radical scavenging capacity of the samples was expressed as Trolox Equivalent Antioxidant Capacity (TEAC). Similar to other antioxidant activity parameters, the highest TEAC values among treatments belonged to AN samples which were also recorded to increase by the increased time of hydrolysis.

In conclusion, the findings indicated that the combined application of Alcalase<sup>®</sup> and Neutrase<sup>®</sup> enzymes for 6 h of hydrolysis resulted in the highest hydrolysis rate and antioxidant activities in BMP hydrolysates. The results also allowed us to conclude that BMP hydrolysates could be

regarded as potential antioxidant ingredients to be further incorporated into food formulations, specifically which are susceptible to lipid autooxidation such as meat products.

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**Keywords:** Antioxidant activity; buttermilk powder.

## OP-51 Alternative Animal Protein Production Systems Within The Scope of Combating Climate Change in Türkiye

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Due to many negative factors, especially climate change in Türkiye in recent years, soil, water, pasture, etc. agricultural production resources are rapidly depleting. According to the climate change scenarios made by the General Directorate of Meteorology, low-high levels of drought are expected throughout Türkiye until 2099. Thus, animal food production in agricultural farms in many regions has been adversely affected by droughts and irregular precipitation in recent years. Since the beginning of the 2000s, climate change mitigation and adaptation studies in agriculture have been carried out by many institutions in Türkiye. Especially after the publication of the European Green Deal (11 December 2019) and becoming a party to the Paris Agreement (France, Paris, 2015) (October 2021), these studies gained momentum. It is stated that the targets and action plans to be developed for combating climate change in the livestock sector at the global level must necessarily include models that will ensure sustainable food security and safety. For this reason, in recent years, studies on the development of alternative animal food production systems that will better adapt to the negative effects of climate change and also have low greenhouse gas emissions have intensified. From this point of view, in this paper, it is aimed to discuss alternative animal food/protein production systems that have low greenhouse gas emissions and can adapt to changes in agricultural production in Türkiye.

**Keywords:** Climate change; food security; alternative animal food production.

## OP-52 A Comparative Study on the Phenolic Extraction of Total Hydro-Alcoholic Extract of *Satureja Hortensis L.* For Bioactive Properties

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*S. hortensis* naturally appearing in Türkiye, especially in Thrace region. It is an annual plant of the *Lamiaceae* members. It has used as spice and medicinal plant is known since ancient times. The natural products obtained from *Lamiaceae* family are dominated by polyphenols and flavonoids, responsible for their antioxidant properties, among others.

In the research, ethanol (EtOH) extracts with different hydro dilutions of the plant samples were obtained by three different extraction methods. The plant material (*Satureja hortensis L.*) belongs to Kirklareli province. Three different extraction methods that traditional, ultrasound and microwave performed for phenolic substance recovery with three ethanol solvents (40%, 50% and 60%, v:v). The total phenolic contents and total antioxidant activities (DPPH) were compared for all samples. Besides, phenolic compositions were determined for the samples that have the highest total phenolic content (TPC) for each method. The plant extracts showed the highest TPC for ethanol (60%, v:v) extracts in traditional extraction (TE), ultrasound extraction (15 min) (US-15) and microwave extraction (2.5 min) (MW-2.5). The other extracts that ultrasound extraction (30 min) (US-15) and microwave extraction (5 min) (MW-2.5) had the highest TPC for ethanol (50%, v:v) extracts.

Some *Satureja* species have been recommended in the literature as a remedy for the treatment of diabetes, also contains antioxidant agents. However, there is not any research for *S. hortensis L.* In the present study that being the first study focused on it, the possible anti-hyperglycaemic and anti-obesity effect of *S. hortensis L.* extracts were investigated. For this purpose, amylase and lipase enzyme activities were determined for extracts. The available data presenting the initial properties of *S. hortensis L.* for next research and applications in industry.

**Keywords:** *Satureja hortensis*; bioactivity; extraction; phenolics; ultrasound.

## OP-53 Effect of the Emulsifier Dosage on Macaron Cookie: Texture, Color, and Moisture Properties

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Traditionally, macaron cookies are made with egg whites, icing sugar, granulated sugar, almond flour, and often food coloring. [1] Industrial pastry macaron mixes consist of emulsifiers, which are crucial for the quality of the final product. [2] In this study, polyglycerol esters of fatty acids (E475) were dosed with 0, 0.5, 1, 1.5, and 2 % to evaluate the quality properties.

E475 dosages of 0, 0.5, 1, 1.5, and 2 % E475 were added to a fixed recipe, dosed on the powder mix basis. Texture Analyser CT3 (Brookfield) device was used for shell texture (hardness (g), cohesiveness, springiness (mm), gumminess (g), chewiness (mJ)) analysis. Colorimeter CR-5 (Konica Minolta) device was used for the color of the macaron shells. Moisture Analyser HB43-S (Mettler Toledo) device was used for the moisture content of the macaron shells. Analyses were performed in 10 parallel.

The hardness, cohesiveness, springiness, gumminess, and chewiness values of the shells were calculated for control macaron; 303.2 ±44.02, 0.23±0.02, 1.15±0.27, 70±13, and 1.23±0.32, respectively. For the 1 % emulsifier, the results were 1346.1±156.2, 0.13±0.02, 1.59±0.14, 177±31 and, 2.62±0.5, respectively. The colorimeter (L) results for 0, 0.5, 1, 1.5, and 2 % emulsifier were 80.4±1.2, 82.37±1.1, 83.5±1.2, 84.15±1.3, and 85.46±1.2, respectively. The moisture (%) content for 0, 0.5, 1, 1.5, and 2 % emulsifier were 5.22±0.56, 4.72±0.5, 3.69±0.41, 3.51±0.35, and, 3.34±0.3, respectively.

According to the results of the analysis, there was a significant difference between the emulsifier dosages. The 1 % emulsifier amount gave the best result for this formulation. An increase in the emulsifier increased the hardness and whiteness of the macaron shells. On the other hand, an increase in the emulsifier resulted in a decrease in moisture content. However, the amount and the type of the emulsifier must be carefully decided for every formulation.

**Keywords:** Macaron; food emulsifiers; texture analyser; industrial pastry.

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## OP-54 Forensic Aspects of Adulteration in Sports Supplements

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Sports supplements (SS) frequently contain adulterants, which is a serious issue in the world. SS has brought the risks of quality control, security, deliberate mislabeling and contamination<sup>1</sup>. Depending on the use of these, clinical poisoning, organ or system damages have begun to become widespread. Also, it is reported that illegal or drug-related compounds are viewed as adulterations. Amphetamine, ephedrine, sibutramine and 1,3- dimethylamylamine (DMAA) are just a few of known adulterants that have been identified in SS researches<sup>2</sup>. Users describe these items, which feature mystical formulations in their advertising, as having a performance-boosting effect<sup>1</sup>. So, this situation may cause users to engage in crimes unconsciously. Cinnarizine, which is frequently taken to treat travel sickness, is one of the second-leading causes of Parkinson's and has serious side effects<sup>3</sup>. Cinnarizine can easily be converted into piperazine components, which currently replaces ecstasy as a "Street drug"<sup>4</sup>. This circumstance demonstrates the potential hazard of SS used for health and highlights their significance in forensic investigations. The analytical and legal aspects of cinnarizine determination in various SS in Turkish markets are reported in this study. Detection and confirmation of cinnarizine and its by-products were achieved by the m/z ratio and the mass spectral fragmentation pattern. To the best of our knowledge, "Cinnarizine" active compound was detected in SS for the first time ever. Due to its rapid degradation, it is crucial to isolate and identify cinnarizine and its by-products, especially 1-benzylhydrylpiperazine<sup>5</sup>. In this respect, it is of great importance for public health to be able to market SS, which has a multi-billion-dollar market and is dominated by numerous advertisements, in a reliable manner with precision inspections conducted by the competent authorities and high-quality control. Also, new analyzing methods which especially focused on easily degradable compounds might resolve those uncertainties in this area.

**Keywords** Adulteration; sports supplements; cinnarizine; piperazine; GC-MS.

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## OP-55 Nutritional properties and Fatty Acid Constituents of *Lepista personata* (Fr.) Cooke

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Edible mushrooms are a valuable food product they are used in medicine as biologically active additives and in the food industry as a valuable protein product. Due to the significant content of natural compounds, several components with different biological activities have been isolated from mushrooms, and this tendency continues at present. Currently, the study of the biological activity of mushrooms is an actual due to the content of various components in their composition, which have shown various types of activity, such as cytotoxic, antioxidant, anticholinesterase and anti-inflammatory activity. [1-3]. The nutritional properties and fatty acid constituents of mushrooms are an equally important part of the study of biological activity. The content of some fatty acids affects the increase in activity.

*Lepista personata* belongs to the family Tricholomataceae, order Agaricales. Firstly, this study aims to study the fatty acid constituents of *Lepista personata* previously unreported and collected from the Almaty region, Kazakhstan. As part of the study, the petroleum ether, acetone, and methanol extracts, as well as hot water-based extract, were prepared. The petroleum ether extract was methylated and injected into the GC and GC-MS to screen for their fatty acid ingredients along with steroidal content. Linoleic acid, oleic acid, and palmitic acid were detected as the major amounts besides stearic acid and meristic acid. Secondly, as a future study, since the polar extracts exhibited cytotoxic activity against column cancer cell lines, the acetone extract and the methanol extract will be used to identify the biologically active compounds isolated by activity-guided fractionation.

**Keywords:** *Lepista personata*; fatty acid.

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## OP-56 Anti-Cancer Effect of *Tricholoma sculpturatum* on Lung (H1299) Cancer Cell Lines

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*Tricholoma* species having medicinal properties belong to the family of the Matsutake. *Tricholoma matsutake* is used both as food and medicinally around the world. It is a preferred species due to medical usage, especially in treating cancer diseases and strengthening the immune system. Researchers have shown that *Tricholoma* species have anticarcinogenic activity on various human cancer cells due to containing polysaccharides, sesquiterpenes, lectins, phenolic compounds,  $\alpha$ -D-glucans and other terpenoid class compounds. Lung cancer is the most common cancer incidence in the world. Interest in bioactivity studies has increased daily high medicinal activities of the compounds of mushrooms that prevent cancer and support the immune system (immunomodulator) (Moradali et al., 2007; Zhang et al., 2007; Han et al., 2013).

The aim of this research was to prepare petroleum ether extract from *Tricholoma sculpturatum* (Fr.) Quel. to determine the cytotoxic activity against lung (H1299) cancer cell lines using the MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) method. The results were

given as EC<sub>50</sub> values. Since the petroleum ether extract indicated cytotoxic activity, we planned an activity-guided fractionation. Bioactive compounds will be isolated and elucidated by an activity-guided fractionation to develop potential cancer therapeutics as a future study.

**Keywords:** *Tricholoma sculpturatum*; lung (H1299) cancer.

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## OP-57 Sustainability in Food Industry

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The food systems are staying at the center of interest because of two basic questions: security of food supplies in the developing world a food safety in the developed countries. In the last years there other questions (sustainability or sustainable food systems) also have been coming up and there are investigating their connection to globalized food systems, genetically engineered or organic foods.

The Sustainable Development Goals (SDGs)8, adopted by the United Nations in 2015, build on the Millennium Development Goals and provide a useful framework for understanding and acting upon the issues over a 15-year period.

In 2020, we continued to focus on our sustainability goals while protecting the health of our employees and ensuring that consumers have access to healthy, safe, and sufficient food as Sutas sustainability team. Thanks to our integrated business model “Farm to Table,” we now meet 69 percent (up from 31 percent) of our energy needs from the renewable energy produced from our own waste. We have also improved the organic structure of soil on 50,000 decares of land. We have made sure that all our facilities receive the Basic Level

Zero Waste Certificate. As part of the Business Plastics Initiative (IPG), we have reduced our use of plastic packaging by 344 metric tons. All these developments were made possible by our board-level Sustainability Committee, and our working groups and employees, who have made the achievement of our goals a part of their daily operations.

**Keywords:** Sustainability; food industry.

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### OP-58 Novel Approaches to Achieve Edible Oil Safety Goals

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Edible oils play an important role in food industry. Vegetable based refined oils are used in catering, bakery, confectionary, fast food industry as well as in catering for culinary purposes. Therefore food safety risks also have to be defined as oil safety due to high importance of refined edible oils.

Crude oils are subjected to a series of operations called as refining to ensure the quality attributes of oils. These processes involve a series of physical and chemical operations where oils are subjected to elevated temperatures for a considerable period of time. These high temperature levels act as an oil safety tool by removing PAHs, pesticides, etc. But in some circumstances, high temperature levels lead in production of process contaminants, namely GE and MCPDE. This is mostly due to primitive technology levels of refineries as well as low quality crude oils. Moreover, recent developments in chromatography and toxicology; lead food society to a complete understanding of new range of food contaminants known as mineral oils.

Science and technology recently are capable of accurate measurement of MCPDE and GE in edible oils and fats. Nevertheless there is limited work on the effect of food ingredients and food processing steps on MCPDE and GE levels in oil containing food productions. Basic discrepancy is the lack of a standardised procedure for oil extraction from various food matrices due to their complexity.

Major aim of this study is to develop a relevant method for oil extraction from food matrices to sustain an evident measurement of MCPDE, GE and mineral oils. Moreover the occurrence pathway of process contaminants in various foods are documented by GC-MS measurement followed by Ultrasound assisted leaching of oils from foods.

As follows a set of data obtained by ultrasound assisted oil extraction followed by GC-MS detection in Table below.

Sample Name	3-MCPDE	GE
Margarine	2,84705	1,95225
Handmade Salty Unspiced Crackers	2,6992	1,50505
Handmade Unsalted Unspiced Crackers	2,92255	1,54235
Industrially Produced Saltine Crackers	1,2122	0,3652
Handmade Salty Spicy Crackers	3,18675	1,04075
Handmade Unsalted Spicy Crackers	2,9502	1,43055
Industrially Produced Salty Spiced Crackers	1,6392	0,4963

**Keywords:** Oil safety; GC-MS; MCPDE.

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### OP-59 Obtaining High Viscosity Flavorings With Using Emulsification Method

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Consumption and preference of foods are related to the stimulation of human senses such as sight, taste and smell. The aroma properties of foods, together with their appearance and structural features, are primarily effective in the preference of that food [1].

Aroma compounds are volatile molecules that are in the vapor phase at room temperature and are detected by reaching the olfactory tissue (olfactory receptors) in the nasal cavity. The release of flavor compounds from the food into the vapor phase is due to their interaction with the non-volatile compounds present in the food matrix [2]. With increasing temperature, volatile aromatic raw materials rapidly pass into the gas phase and cause loss of flavor. It removes taste and odor during consumption by removing it from the food. Xanthan gum is resistant to degradation by heat treatment [3]. Xanthan gum was used in the studies. Xanthan gum solutions are pseudoplastic liquids. In this way, formations that affect many sensory qualities such as mouth feel, taste perception and suspension formation were used. Xanthan gum protects flavoring substances like a film, reducing and protecting their volatility, thus preventing losses. The high viscosity (150-200 mPa.s) of the developed sweeteners directly affects the aroma release. The volatility of flavoring agents decreases with increasing boiling point and decreasing vapor pressure as a result of increasing viscosity. In addition, thanks to the glucose-fructose syrup of aromatic raw materials, it has gained an adhesion feature that will keep it in the mouth for a long time. For this purpose, high viscosity chocolate, hazelnut, strawberry, lemon, orange, banana and cherry

flavors have been developed to be used in jelly, cocktail syrup and cake sauces.

As a result of sensory analysis, it was confirmed by the panel team that high-viscosity flavors containing xanthan gum were more intense in terms of taste and odor in food end products than liquid flavorings. With this result, high viscosity sweeteners containing xanthan gum prevented the release of volatile aromatic compounds and improved taste perception by providing a sticky feeling in the mouth.

**Keywords:** Olfactory receptors; xanthan gum; aromatic compounds.

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### OP-60 Effect of Different Homogenization Parameters on Collagen Added Cold Coffee Textural Properties

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According to the cold coffee consumption trends in the last 5 years, it has been observed that cold coffee is consumed without being affected by demographic data such as gender, age, social and economic status. As announced in the 2018 World Coffee Consumption Report prepared by the International Coffee Organization, coffee consumption in Türkiye has increased by 13.2% in the last 5 years.

Collagen-added products have become one of the trends that attract attention in the world food market in recent years. Collagen is protein in our body which is the main component of connective tissue. Collagen provides multidimensional benefits for skin, bone and joint health by regenerating the cells needed for maintaining an active lifestyle and enhanced immunity, health, strength and elasticity throughout the body (1,2). The increase in the consumption of protein-added foods and beverages in recent years has increased this expectation for cold coffee drinks.

When coffee consumption habits are examined, it is expected that cold coffee will have sensory properties such as desired flavour, texture and appearance. While using a collagen in sufficient amount for nutrition, it is necessary to maintain the taste and texture that the consumer is looking for (3). For providing the best cold coffee taste and texture to consumers, products should have optimum recipe ingredients and process

conditions. After the determination of optimum sugar, milk and collagen level, homogenization stages are applied at five different pressure to decide the best texture stability.

According to process data, it's observed that homogenization pressure is one of the important parameter that effect the texture of collagen added cold coffee (4). Regarding to this result, the homogenization pressure in collagen added cold coffee was increased to 250 bar provided more homogenous appearance and more smooth mouthfeel products.

In conclusion homogenization pressure is important parameter that effect the textural stability of collagen added cold coffee products.

**Keywords:** Collagen; coffee.

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### OP-61 Evaluation of Nutrient Content and Quality Profile of Improved Spring Oat (*Avena Sativa* L.) Varieties at The Aegean Region

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Oat has become a growing concern due to its positive role in human nutrition and health. The research was conducted to evaluate the spring oat (*Avena sativa* L.) cultivars developed in the environmental conditions of the Aegean Region in terms of nutrient content and quality profile. The study was carried out as 3 different oat yield trials (YVD-1, YVD-2 and YVD-3) according to the randomized blocks trial design with four replications in the experimental fields of Aegean Agricultural Research Institute (ETA) in the production years of 2021-2022. As research material, 25 genotypes were included in each yield experiment. Standard cultivars (Sarı, Fetih, Kahraman, Manas) in each yield trial were used as research material. In the research, these cultivars were analyzed for the protein, total starch, mixed linkage beta-glucan, grain size (sieved 2.2 mm slotted), thousand grain weight, hectoliter weight. At the same time, the flour and oatmeal form of our commercially attractive Manas variety



were analyzed for the protein, total starch, mixed linkage beta-glucan. The hectoliter weight, thousand grain weight and grain size of the oat cultivars ranged between 42.50-58.00 kg/hl; 28.40-36.00 g; 17.00-67.00 % respectively. The protein, total starch, mixed linkage beta-glucan of the standard oat cultivars ranged between 14.68-17.43 %; 37.91-45.53 % and 3.12-4.40 % respectively. For the results of our commercially developed Manas variety for human nutrition; the protein, total starch, mixed linkage beta-glucan of the commercial flour of Manas ranged between 15.86 %, 50.51 % and 5.47 % and the protein, total starch, mixed linkage beta-glucan of the commercial oatmeal of Manas ranged between 13.45 %, 65.37 % and 5.65 % respectively. The oat cultivars showed good results from the point of nutrient content and quality profile. When the promising analysis results obtained from breeding trials were evaluated, it was shown that it was important to carry out breeding studies in terms of quality and nutritional characteristics.

**Keywords:** Oat; nutrition; quality profile.

## OP-62 Analysis of Ethylene Oxide and 2-Chloroethanol Residues in Walnut Samples Using GC-MS/MS

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Ethylene oxide (EO) is widely used as a food fumigant due to its strong antibacterial properties. Because of its carcinogenic, mutagenic and reprotoxic potentials, EO has been banned in European Union (EU) countries in recent years. But, the use of this compound is still permitted in several countries and numerous alerts for EO residues in various food samples, especially sesame, were reported by European Commission (EC) Rapid Alert System for Food and Feed portal (RASFF)<sup>1</sup>. In the last two years, EO was detected in only 8 samples of food additives originated from Türkiye. Because of its high volatility, EO rapidly dissipates to its less volatile metabolite "2-chloroethanol (2-CE)". Based on the EC Regulation (396/2995), EO residue is defined as sum of ethylene oxide and its main metabolite 2-CE. The aim of the present study was to validate a reliable chromatographic method for the determination of EO and 2-CE by GC-MS/MS in commodities with high oil content. Dried walnut samples were chosen as a representative of this commodity group and validation studies were performed according to the SANTE/11312/2021 guidelines<sup>3</sup>. After a pretreatment at 70°C for 40 min, the extraction and cleaning up procedures were conducted with QuEChERS method<sup>2</sup>. Matrix-matched internal curves of EO and 2-CE in the range of 5-100 µg kg<sup>-1</sup> showed good linearity. Average recovery rates were 96.4 and

100.3% for EO and 95.9 and 89.3% for 2-CE, when tested at 2 concentration levels of 10 and 40 µg kg<sup>-1</sup>, respectively. The maximum RSD values of repeatability (RSD<sub>r</sub>) were 12.7 and 15.6% for EO; 11.8 and 16.2% for 2-CE for 10 and 40 µg kg<sup>-1</sup> concentrations of the compounds, respectively. The maximum RSD values of reproducibility (RSD<sub>WR</sub>) for same concentrations were 14.7 and 15.3% for EO; 10.9 and 13.6% for 2-CE, respectively. Limit of quantification (LOQ) values for 5 µg kg<sup>-1</sup> of both compounds were found as 7.6 and 8.9 µg kg<sup>-1</sup> for EO and 2-CE. The validated LOQ values for EO and 2-CE were under the lowest Maximum Residue Limits of EU (50 and 10 µg kg<sup>-1</sup>, respectively) of the compounds for walnut sample. The validation data of both compounds obtained in GC-MS/MS analysis was quite reliable and were in line with the SANTE/11312/2021 Guideline<sup>3</sup>. This study was funded by Perla Fruit Company with the grant number of ULUTEK STB079417.

**Keywords:** Walnut; ethylene oxide; 2-chloroethanol residues.

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## OP-63 Sugar Reduction, Alternative Sweeteners, Steviol Glucosids

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Sugar; It is a natural compound obtained from sugar beet and sugar cane. It is a pure carbohydrate, commonly known as sucrose. The total amount of sugar consumed in the daily diet; 'free sugars' naturally found in foods and 'added sugars' added during processing or preparation of foods. Sugar; It is added to flavor foods and beverages, to increase their durability/shelf life, and to provide their structure and consistency. [1] One of the key areas of focus is sugar



reduction, as many health departments make more efforts to reduce sugar in manufacturers' food and beverage products. There is a wide variety of ingredients and solutions available today that can help reduce or replace sugar in food and beverage products. [2] The sweet compounds found in stevia leaves are diterpene glycoside (steviol glycoside) compounds. Diterpene steviol glycoside components; Defined as Steviol, Steviolbioside, Stevioside, Rebaudioside A, B, C, D, E, F, Rubusoside, Dulcoside A. The main sweetening ingredients are Stevioside and Rebaudioside A. [3].

**Keywords:** Sugar reduction; alternative sweeteners; steviol glucosids.

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### OP-64 Chewable Vegan Sport Gummy with High Content of Calcium

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Recently, vegan lifestyle is becoming really popular and people has started to acquire awareness about healthy life. Thereby, healthy snacks and special sport nutrition's have been in demand. <sup>1</sup> It can be determined as calcium content snacks and vitamin supplements with vegan concept. <sup>2,3</sup> Confectionery supplements especially gummies are more popular while comparing capsules, tablets supplements, because they have more advantages such as easy to take, there is no need of water. Additionally, they have taste alternatives therefore this concept is pleasurable to eat. In this study; the recipe of vegan and high content of calcium chewable sport gummies has been developed and texture – sensory specialties are examined.

One of the important ingredients in this project is calcium lactate which absorbs the water molecules on itself hence; it prevents to loss of water during the sport. Also, the content is enriched with sodium and sea salt, this becomes a source of minerals that replaces the losses during the activities. Plus, Vitamin B12, Folic Acid and natural caffeine source of Guarana extract is used in the formula, therefore this product helps to feel more energetic after the gym.

TCS, 2<sup>nd</sup>, International Food Chemistry Congress  
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While developing this recipe, the chemical dynamics of herbal gelling agents with active ingredients are concerned with shelf life and stress conditions. As a result of many experiments, it has been observed that the most suitable taste and texture are obtained with pectin. After the studies, the chemical balance of pectin with vitamins and minerals has been determined and the final formula has been reached.

The hardness value of the final product was determined as 503(g) due to the high amount of calcium. The slightly hard structure of the product creates a combination effect as sugary and salty contrast taste. The elasticity value was measured as approximately 0.1(g), which shows the effect of the cut-able structure (from pectin) on the elasticity. The adhesion value was measured as 0.300(g) and it supported the chewability 35.8(g). In the case of chewability property, the value measured as 149(g), it supports the impression that it creates the perception of a salty snack that athletes enjoy consuming.

**Keywords:** Soft candy with calcium; pectin gummies; sport nutrition.

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### OP-65 Ultrasound-Assisted Extraction of Bioactive Compounds from Chokeberry Pomace

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Chokeberry (*Aronia melanocarpa*), a member of the *Rosaceae* family, is native to eastern North America.<sup>1</sup> Berries of Aronia are one of the richest resources of phenolic compounds among other berry fruits, and this fruit is rich in flavonols, anthocyanidins, proanthocyanidins and antioxidants.<sup>2, 3</sup> Chokeberry has numerous medicinal and therapeutic effects including, anti-tumor, anti-diabetic, anti-obesity, anti-infective, antioxidant and neuroprotective activities due to its bioactive compound composition.<sup>4</sup> Aronia fruit can be consumed as fresh fruit or used to increase the antioxidant capacity of composite products. During the juice extraction, a significant part of the bioactive components cannot pass into juice and remain in the pomace. The study aims to observe the effect of different solvent phase and time

on the polyphenolic composition of Aronia pomace during the ultrasound-assisted extraction process. Extraction of bioactive components was carried out from freeze-dried pomace (DP) to prevent the degradation of these high-value components from heating. The extraction process was performed using 3 different solvent phases: water, ethanol:water (E:W) 50:50 (v/v) and E:W 80:20 (v/v) at 3 different times as 5, 15 and 30 minutes. Total phenolic content (TPC), total flavonoid content (TFC), total proanthocyanidin content (TPAC), total antioxidant activity (TAA) of the extracts were measured. The highest TPC value ( $6726.44 \pm 195.03$  mg gallic acid equivalent for 100 g DP) was reached with the extraction performed in 30 min using 50:50 E:W. This value was not statistically different from the 15 min extraction using 50:50 E:W. With the treatment of 80:20 E:W for 15 min, the highest TFC content was achieved compared to other solvents and time ( $631.21 \pm 6.18$  mg quercetin equivalent for 100 g DP,  $p < 0.05$ ) and followed by 50:50 E:W solvent. The highest values for TPAC and TAA values were reached when 50:50 E:W was used. There was no statistically significant difference ( $p > 0.05$ ) between 15 and 30 min applications for TPAC ( $19231.72$ - $19626.35$  mg catechin equivalent for 100 g DP). The TAA values were between  $6290$ - $7610$  mg Trolox equivalent for 100 g DP and there was no significant difference ( $p > 0.05$ ) between different time applications. Findings show that 50:50 E:W was the most effective solvent to extract the bioactive compounds from chokeberry pomace.

**Keywords:** Chokeberry pomace; bioactive compounds.

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## OP-66 Melatonin, Natural Sources of Melatonin the Relationship of Melatonin and Magnesium

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Melatonin is a hormone that regulates human biochemical metabolism and physiological rhythm, alleviates related disorders such as jet lag and insomnia, scavenges free radicals and strengthens the immune system. It has anti-aging and protective effects against cancer. Melatonin also has neuroprotective effects. It has important effects on the control of chronic diseases such as heart, diabetes and obesity [1]. Melatonin is naturally found in many fruits such as cherry, tomato, pineapple, orange, kiwi, apple and banana. Although melatonin concentrations vary in different fruit types, they also vary among the same fruit types. Many factors affect these concentrations, including genetics, location, environmental stress, and fruit maturity [2]. In addition to being taken as a supplement, melatonin taken naturally with food is known to improve sleep duration and quality. In a study conducted on elderly individuals with insomnia problems, it was reported that cherry juice mixed with apple juice improved sleep parameters. It was assumed that these results were due to the exogenous melatonin content provided by cherry juice [3].

Tryptophan is an amino acid found in our body and used by our brain. Expressed as the main ingredient used in the production of the hormone melatonin, tryptophan first turns into serotonin. Serotonin first undergoes acetylation and then methylation and turns into melatonin. Magnesium is an essential mineral for the activity of the enzyme N-acetyl transferase, which provides acetylation of serotonin [4].

**Keywords:** Melatonin; magnesium.

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## OP-67 Green Foodomics through Green Technologies

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Food safety, quality, production and processing<sup>1</sup>, developing novel foods and improving the binomial food-health<sup>2</sup> require understanding and modulating the relation among human gut microbiota, host physiology and environmental modulating factors<sup>3</sup>. In this respect, food science and nutrition shifted from classical methodologies to foodomics which is the sum of omics technologies (i.e., nutrigenomics, nutrigenetics, nutritional genomics, transgenics, functional foods, nutraceuticals, genetically modified (GM) foods, nutritranscriptomics, nutripoteomics, nutrimetabolomics and systems biology)<sup>4-7</sup> achieved by combining food and nutrition domains by applying advanced and advanced green (analytical) chemistry principles necessary not only for improving the greenness of the processes and/or the analytical methodologies involved<sup>8,9</sup> but also the consumer well-being, health and knowledge.<sup>10</sup> In a foodomics work, extraction of bioactives from natural sources (i.e., plants, algae, food by-products) while retaining their bioactivity is a key step. Hence, in this study the green methodology underlying how foodomics can integrate the green techniques and technologies to improve processes to maximize production while minimizing the eco-impact to flourish fulfill the social, economic and other requirements of present and future generations.

**Keywords:** Green technologies; foodomics work.

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## OP-68 Use of Olive Leaf Extract as a Preservative in Commercial and Homemade Tomato Pastes

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Tomato paste, produced by various methods, is undoubtedly one of the most important basic ingredients of the food industry. Tomato paste production is basically traditional and commercial<sup>1</sup>. There are various disadvantages of tomato paste produced by both methods according to production conditions and storage conditions. The most important of these problems is the deterioration of the tomato paste used in the home or factory environment. Although various additives and preservatives are used to prevent the deterioration of tomato paste, it is very difficult to prevent this<sup>2</sup>. The high probability of negative effects of chemicals used as preservatives on human health has led researchers to work on natural substances that can be used instead of preservatives<sup>3</sup>. In recent studies, it has been observed that the olive leaf, which has various studies about its anti-viral properties, attracts attention<sup>4</sup>. The study was advanced in this direction and concentrated on olive leaves, which are abundant in our country. In this study, olive leaf extract was used as a preservative in various tomato paste types and positive results were obtained.

**Keywords:** Olive leaf extract; tomato pastes.

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## OP-69 Green Analysis Utilizing Traceability Biomarkers and DNA Analysis for Food Traceability Against Adulteration

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Increasing concern regarding traceability of food products and their ingredients such as fruits, vegetables and plants have become mandatory for the markets and this imposes administrative traceability on all foods (produced, imported or exported)<sup>1</sup>. However, methods to be used to achieve traceability have not been established in the laws and regulations which offered a great freedom to the food chain actors (producers, food processors and vendors) to ensure reliable traceability<sup>1</sup>. Therefore, Geographical Indication, Food safety and quality labels such as the French “Label Rouge”<sup>2</sup> barcode technology have been developed. However, food traceability can be ensured only via multi-technique approaches<sup>3-7</sup>. However, sufficiently discriminating factors should be found and highly flexible, reliable, accurate, rapid, eco-friendly and effective traceability techniques exploiting these factors need to be developed to achieve standardized methods. This brought about the necessity of finding and use of traceability biomarkers and DNA analysis for to ensure product quality and prevent various adulterations. In this work the merits and demerits of current traceability techniques and advantages and application areas of omics technologies benefiting from use of traceability biomarkers are presented.

**Keywords:** DNA analysis; food adulteration.

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## OP-70 Evaluation of Feed and Environmental Contaminations Effect in Racing Horses

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Drug substances which are found in the content of various plants in nature can cause different pharmacological effects depending on their properties by entering into metabolism as a result of contamination in feed and water. International Federation of Horseracing Authorities (IFHA) has defined certain substances originating from feed and environmental contamination in racing horses under the title of residue limit. International Residue Limits (IRL) are determined as caffeine 50 ng mL<sup>-1</sup>, theophylline 250 ng mL<sup>-1</sup>, atropine 60 ng mL<sup>-1</sup>, scopolamine 60 ng mL<sup>-1</sup>, morphine 30 ng mL<sup>-1</sup>, bufotenin 10 µg mL<sup>-1</sup>, N,N dimethyltryptamine 10 µg mL<sup>-1</sup>, hordenine 80 µg mL<sup>-1</sup>, theobromine 2 µg mL<sup>-1</sup>, methylsulfonylmethane 1200 µg mL<sup>-1</sup> and dimethylsulfoxide 15 µg mL<sup>-1</sup> in urine; and theobromine 300 ng mL<sup>-1</sup>, caffeine 20 ng mL<sup>-1</sup> and dimethylsulfoxide 1 µg mL<sup>-1</sup> in plasma. The main source of the substances may be found in the natural structure of plants in the feed mixture, environmental contaminants that can be



mixed with these feeds, and contamination from production and transportation.<sup>1,2</sup> Even horse feeds containing low levels of contaminants can be detected as positive in anti-doping analysis.<sup>2</sup> The aim of this study is to evaluate the feed contaminants detected in some race horses in Türkiye and their detection frequency. Urine or plasma samples taken from race horses are analyzed using methods developed in doping laboratories by chromatographic instruments (GC-MS, HPLC-MSMS, UHPLC-HRMS) that can detect trace levels with high sensitivity. In this paper, the substances in the residue limit category in the last years and found as findings, suggestions are presented for feed contaminants, evaluation of analysis results, ways of transmission and avoidance of victimization.

**Keywords:** Feed contaminants; environmental substances; horseracing.

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### OP-71 Determination of Caffeine Amount of Organic and Non-Organic Coffees

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Organic farming is a controlled and certified form of agricultural production at every stage from production to consumption, without using chemical inputs in production<sup>1</sup>. It has been suggested that there are differences in the amount of some nutrients and non-nutrient compounds in foods produced by organic and conventional agriculture<sup>2</sup>. In the light of this information, the caffeine content of coffees, which is an important consumption product in our country and in the world, has been evaluated in terms of organic and conventional coffees. For this purpose, 12 different types of organic (n=7) and non-organic (n=5) coffees belonging to 5 different brands (A,B,C,D,E) offered for sale in the market were included in the sampling. Care was taken to ensure that all coffees were at the same roasting level (medium roasted/medium strength) and were from 100.0% Coffee

*arabica* beans. Caffeine content of all ready-to-serve coffees; It was analyzed with the help of high pressure liquid chromatography (HPLC) by adapting the method of Shrestha et al. (2016)<sup>3</sup>. The caffeine content of the coffees was expressed as mg/L and the statistical analysis of the data was done with the SPSS 22.0 package program. The amount of caffeine (mg/L) in organic coffees was therefore found to be lower than that in conventional coffees when coffees are compared based on production methods (863.2181.46 mg/L and 1115.4380.88 mg/L, p<0.05, respectively). While the quantity of caffeine in organic coffee from three brands was found to be lower than that of conventional coffee (Organic and conventional, respectively; A:694.9±31.73 mg/L and 1030.8±7.55mg/L; D:853.9±32.50 mg/L and 1576.4±250.94 mg /L; M:1094.2±32.03 mg/L and 1470.7±13.45 mg/L; p<0.05), it was found that the converse was true for the other two brands when the amount of caffeine is compared according to both the production method and the brands (Organic and conventional, respectively; B: 904.9±189.54 mg/L and 831.3± 67.91 mg/L, C: 684.4±63.78 mg/L and 667.7±84.36 mg/L; p<0.05). The amount of caffeine in the coffees acquired using the conventional production method was found to be higher than the coffees obtained using the organic production technique, and the amounts of caffeine in the coffees varied depending on the brands. This integrate the fact that the amount of caffeine in food can depend on whether or not production inputs are employed in the agriculture.

**Keywords:** Caffeine; non-organic coffees; HPLC.

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**OP-72 Dietitians' Expectations from The Food Industry Regarding Preventing Obesity During the Covid-19 Pandemic**

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This study aimed to determine dietitians' expectations from the food industry to prevent the rising prevalence of obesity during the COVID-19 pandemic. The data were collected in 213 dietitians (108 intern dietitians and 105 senior dietitians) by the online questionnaire between May 2021 and January 2022. Ethical approval was obtained from Atılım University Human Research Ethics Committee (E-59394181-604.01.02-9055 numbered and 26/05/2021 dated). The mean age of the participants is 25.4±4.44 years (21-49 years), and the active working time is 4.7±4.27 years (1-27 years). Most of the participants (90.6%) think that the COVID-19 pandemic contributes to the rising prevalence of obesity. According to the dietitians who participated in our study, the food industry plays an active role in preventing obesity by making healthy foods more economically accessible (90.9%), increasing the variety of healthy food products (83.2%), and designing grocery racks to highlight healthy foods (83.2%). Besides, 76.5% of the participants have stated that food labels do not include sufficient information to prevent obesity and updating is necessary for specific topics such as making it easier to find, read, and understand ingredients (88.1%), making it easier to find and read information about energy content (78.0%), re-examining and revising of the total sugar content of the food and updating the percentage of sugar content (74.4%). In conclusion, obesity was one of the most important public health problems that were increasingly prevalent before the COVID-19 pandemic period. However, various factors such as increased stress level, time spent at home, decreased physical activity level, sleep disorders during the pandemic period contributed to this prevalence<sup>1</sup>. According to dietitians in this study, environmental regulations such as easy access to healthy foods, more transparent and understandable labelling and ingredient expression, diversification of healthy foods, and reformulating foods to make them healthier have become even more essential to support individual efforts to ensure weight management.

**Keywords:** Obesity; covid-19 pandemic; dietitians.

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**PP-01 Analysis of Paraquat and Diquat Pesticides Residues by LC-MS/MS Method in Various Food Products**

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Paraquat and diquat are broad-spectrum herbicides, highly polar substances with high solubility in water. Although it is banned by the European Union, it is used in many countries to prepare the soil for planting and to control weeds in more than 100 crops such as rice, potato, corn, cotton, wheat, apple, soybean, sugarcane, cocoa. [1] In developed countries, programs have been established to control exposure and the presence of pesticide residues in food and feed. In the European Union, Multi-Annual Control Programs for pesticide residues (MACP) are run by all member states to ensure compliance with maximum residue levels (MRL) of pesticides and to assess consumer consumption of pesticide residues in plant and animal foods.

Paraquat and diquat have permanent ionic character and high hydrophilicity and are not adsorbed in the reverse phase chromatographic column due to their polar properties. For this reason, the QuEChERS methodology, which is the common extraction procedure of pesticides in many different groups, is insufficient, extraction and sample cleaning require special conditions. The Rapid Extraction of Polar Pesticides (QuPPe) method developed by European Reference Laboratories proposes methanol extraction with hydrochloric acid for paraquat-diquat pesticides. In this study, modifications were made in the extraction solution with reference to the QuPPe method. In addition, chromatographic separation is enhanced by the selection of hydrophilic interacting analytical column with positively and negatively charged (zwitterionic) functional groups on the silica and tandem mass spectrometry (LC-MS/MS) combined with liquid chromatography provides highly sensitive and selective detection for the analysis of paraquat-diquat pesticides. [2,3,4]

**Keywords:** Pesticides residues; LC-MS/MS.

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## PP-02 Analysis of Glyphosate Aand Other Highly Polarity Pesticide Residues by LC-MS/MS Method in Various Food Products

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Glyphosate and other pesticides are widely used in agriculture to improve crop quality and production efficiency, as well as to combat weeds and pests that compete with crops. The long-term effects of polar pesticides, which are generally applied before planting and to optimize the ripening process, are worrisome but need to be monitored. [1] Due to the physicochemical properties of high polarity pesticides, pesticides in many different groups are difficult to analyze with the QuEChERS methodology, which is a joint extraction procedure. For this purpose, The Quick Extraction of Polar Pesticides (QuPpe) method for single residue methods (EURL-SRM) was developed by the European Reference Laboratories in 2008. However, modifications in analytical and chromatographic conditions still continue in the QuPpe method. Tandem mass spectrometry (LC-MS/MS) combined with liquid chromatography provides highly sensitive and selective detection for the analysis of YPPs, since the choice of analytical column, matrix effect, efficiency in the extraction will be effective in the detection of highly polar pesticides (YPP). In this study, chromatographic separation was achieved with new generation columns, and quick and easy procedures were developed by extraction from various foods with acidic methanol. [2,3,4]

**Keywords:** Glyphosate; LC-MS/MS.

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## PP-03 Histopathological Assessment of the Effects of the Flavonoid Fustin Isolated from *Cotinus Coggyria* Heartwood in a Model of Trinitrobenzensulfonic Acid-Induced Colitis in Rats

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The present study evaluated the effects of the flavonoid fustin on the histopathologic changes of colitis induced by trinitrobenzensulfonic acid (TNBS) in rats.

Fustin was isolated from *Cotinus coggyria* heartwood and purified [1]. The experiment was performed on thirty male Wistar rats allocated to three groups: Control, TNBS and TNBS+F10. In groups TNBS and TNBS+F10, colitis was induced by rectal administration of 10 mg TNBS. Treatment began 24 hours after colitis induction and continued 10 days. Fustin at a dose of 10 mg/kg prepared as a suspension was given orally to TNBS+F10 group while the vehicle for fustin was given to groups Control and TNBS. Changes in epithelium and intestinal glands, inflammatory cell infiltration and severity of edema were evaluated histopathologically by light microscopy [2].

The colon samples of control rats showed a normal microscopic appearance. In TNBS group, there were diffuse mucosal ulcerations involving the submucosa, severe and diffuse inflammatory cell infiltration in the entire intestinal

wall as well as a focal edema. Treatment with fustin reduced significantly the edema severity ( $p < 0.05$  vs. TNBS group). It also slightly reduced the changes in epithelium and intestinal glands, as well as the inflammatory cell infiltration.

Fustin at a dose of 10 mg/kg ameliorated some of the histopathological parameters of TNBS-induced colitis in rats.  
**Keywords:** *Cotinus Coggygia*; trinitrobenzensulfonic acid; rats.

**Acknowledgements:** This work was funded by the Bulgarian National Science Fund, Ministry of Education and Science, grant number KP-06-N43/6 (KII-06-H43/6/2020).

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### PP-04 Effects of the *Cotinus Coggygia* Flavonoid Fustin on the Visible Signs of Colitis Induced by Trinitrobenzensulfonic Acid in Rats

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The aim of the present study was to evaluate the effects of the flavonoid fustin on the visual signs of colitis induced by trinitrobenzensulfonic acid (TNBS) in rats [1].

Fustin was isolated from *Cotinus coggygia* heartwood and purified [2]. Thirty male Wistar rats were allocated to three experimental groups: Control, TNBS and TNBS+F10. In groups TNBS and TNBS+F10, colitis was induced by rectal administration of 10 mg TNBS, while the controls received saline. Treatment began 24 hours after colitis induction and continued 10 days. Group TNBS+F10 received orally fustin at a dose of 10 mg/kg prepared as a suspension. Groups Control and TNBS were treated with the vehicle for fustin. Adhesions of the colon to adjacent organs and sings of

obstruction were evaluated. The length (cm), the weight (g) and the wall thickening of the large intestine were recorded, the weight/length ratio was calculated and the dimensions of the necrotic area were measured (mm<sup>2</sup>).

In the TNBS group, the adhesions of the colon to adjacent organs were prominent, the area of necrosis was extensive and the large intestinal wall was thicker than normal. The weight of the colon at the site of injury was increased ( $p < 0.001$ ), the length was decreased ( $p < 0.001$ ) and the weight/length ratio was significantly higher ( $p < 0.001$ ) in comparison with the controls. The treatment with fustin significantly ameliorated the adhesions ( $p < 0.05$  vs. TNBS) and area of necrosis ( $p < 0.05$  vs. TNBS). Compared with TNBS group, in fustin-treated rats, the weight of the colon at the site of injury as well as the weight/length ratio were significantly decreased ( $p < 0.05$ ). The length of colon and the thickening of the wall were not significantly changed.

Trinitrobenzensulfonic acid caused severe colitis in rats assessed by macroscopic indices. The treatment with fustin at a dose of 10 mg/kg decreased the visible signs of colitis.

**Keywords:** *Cotinus Coggygia*; trinitrobenzensulfonic acid; colitis; rats.

**Acknowledgements:** This work was funded by the Bulgarian National Science Fund, Ministry of Education and Science, grant number KP-06-N43/6 (KII-06-H43/6/2020).

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### PP-05 Evaluation of Different Emulsifiers Efficiency in Florentine Production Using Vacuum-Belt Technology

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Vacuum belt dryers (VBD) are continuous and automatic drying systems. VBD is a suitable method that can be used for hygroscopic, high viscosity foods. By reducing the pressure in the dryer with vacuum, the boiling point can be lowered and drying at lower temperatures can be performed. Thanks to the air-locked vacuum system, oxidative degradation can be prevented due to the low oxygen concentration in the drying cabinet and the maillard reaction that may occur in the product can be prevented [1,2].

In this way, losses in quality parameters such as product texture, color and aroma are minimized. Thanks to the air-locked vacuum system, oxidative degradation is prevented due to the low oxygen concentration in the drying cabinet.



The Maillard reaction that may occur in the product can be controlled. A high amount of product can be processed with a short processing time [1,2]. In this project, the effect of different emulsifiers on the final product was investigated in the production of florentine, which is used as a binder in bakery products, by utilizing the benefits of belt vacuum dryer. Since the emulsion structure is of great importance for the production of florentine, emulsifiers affect the quality of the final product. Emulsions are thermodynamically unstable and therefore tend to degrade over time due to a variety of physicochemical mechanisms, including gravity separation, flocculation, coalescence, particle aggregation, Ostwald ripening, and phase separation [3,4,5]. For this reason, the prescription and process behavior of different emulsions in the production of fluorentine were investigated.

Color, brix, bulk density, cooking test and pH were measured in the recipes prepared with A, B and C emulsifiers. The analysis values were found close to each other. A and C lecithins were found to be appropriate when the results of the cooking test, which determines the effect on sensory quality, were evaluated.

**Keywords:** Vacuum-belt technology.

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## PP-06 The Importance of 3D Printing Technology for The Food Industry

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3D printing technology is digitalization for the food industry, and in recent years, this technology plays an important role in producing various snacks, gels, pasta, chocolate, pizzas, etc. 3D printers are suitable for people with diseases such as age, gender, special nutritional needs, chewing and swallowing difficulties, etc. This technology simplifies the production process and does not require additional labor and cost. In addition, it enables the production of new and functional food in different colors, textures, structures, and ingredients. 3D printing technology is environmentally friendly and provides sustainable production. Since production is made according to orders and special needs, it provides both a reduction in the amount of waste and packaging and energy savings. In 3D printing, a melted filament or paste is extruded via a small nozzle while the position of the nozzle is computer-controlled in accordance with a shape design model. In this way, complex and elegant shapes can be designed with Computer Aided Design that cannot be produced with traditional processing methods and meets the personalized food needs of consumers. 3D printers are usually designed/modified according to products <sup>1-4</sup>. The challenges in 3D food printing are selecting ingredients, the rheology of the mixture, structure accuracy, shape stability, compatibility with traditional food processing technologies (e.g. baking and drying), and printing speed <sup>3,5</sup>. The limited number of materials that can be printed with 3D printers reveals the importance of increasing studies on this subject. In addition, food design with 3D printers is an open subject for the development of both 3D printers and new foods. Increasing the variety of printable products, developing special products for different consumer groups, producing serial and more products, and producing standard products in appropriate structures should be considered within the scope of the studies to be performed about 3D printers. In this context, the aim of this review is to highlight the importance, applicability, advantages, and disadvantages of 3D printers for the food industry.

**Keywords:** 3D printing technology; food industry.

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### PP-07 Determining the Nutritional Values and Possible Risks to Food Safety of Fruit Juice Processing Wastes

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The rapid increase in the world population and limited food resources are among the most important problems of today and the coming years, and it is a necessity to transform food wastes into other products with high added value<sup>1</sup>. In the evaluation of food industry waste; The composition of the wastes (such as carbohydrates, proteins, fats), the presence of toxic components (such as heavy metals, herbicides and insecticides), investment cost, and the conversion of waste into new products within the scope of the circular economy are evaluated<sup>2</sup>. In this study, some physicochemical properties, mineral substance contents and risky heavy metal contents and microbiological properties that are important in the evaluation of qualified processing wastes in the fruit juice industry, which are of great importance for our country's economy were determined and evaluated in terms of conversion into other products with high added value. Dry matter, protein, oil, sugar, pH, ash, mineral matter and heavy metal analysis, aerobic colony count, coliform bacteria count and mold and yeast analysis were carried out on 16 different fruit juice wastes. As a result, it has been understood that fruit juice wastes have the potential to be transformed into qualified products in terms of food components and for this, existing risks such as microbiological and heavy metals should be eliminated.

**Keywords:** Fruit juice.

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### PP-08 *Cotinus coggygia*-Derived Bioflavonoid Fustin Suppresses Acute Paw Inflammation in Rats

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*Cotinus coggygia* (European smoketree) is a medicinal plant, rich in flavonoids such as fustin.<sup>1</sup> Studies have shown that these chemicals possess an anti-inflammatory effect.<sup>2</sup> However, fustin has not been evaluated *in vivo* for its anti-inflammatory potential. In this study, 30 male Wistar rats were distributed between 3 groups (n=10 in each group): Control, F10 and F20. Once daily for a week, animals were given the following pretreatment through an orogastric gavage: the control group – 10 ml/kg distilled water, groups F10 and F20 – 10 ml/kg suspensions containing fustin in two doses – 10 mg/kg and 20 mg/kg, respectively. To induce acute inflammation, after the pretreatment period, the mucopolysaccharide carrageenan was injected into the left hind paw. Paw edema was measured using a digital plethysmometer at 0, 30, 60, 120, 180, 240, and 300 minutes after the injection. The results showed that paw edema in the control group gradually rose and peaked at the 180<sup>th</sup> minute. Fustin pretreatment with both doses decreased the edema during all time periods, with a significant impact on the 30<sup>th</sup> and 60<sup>th</sup> minute. In conclusion, the study demonstrated that *Cotinus coggygia*-derived flavonoid fustin could suppress acute carrageenan-induced paw inflammation in rats.

**Keywords:** *Cotinus coggygia*; bioflavonoid.

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## PP-09 False Positive Identification of Acrinathrin in Raisin with QUECHERS Method in GC-MS/MS Determination: Problem Definition and Solution Method

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Acrinathrin and lambda-Cyhalothrin are pyrethroids, pyrethrins (classified as 3A subgroup) which are classified as sodium channel modulators. It has been categorized as possible with the nerve action primary site effect<sup>1</sup>. This 3A subgroup are also defined as synthetic pyrethroids, which have been in use since 1940. They are derived from pyrethrins, which are natural substances found in the extract from the flower heads of *Chrysanthemum cinerariaefolium*. While the inherent toxic potential of pyrethroids is high, with LD50 ranging from 0.5 mg/kg to 250 mg/kg, especially for type II compounds, they are generally considered safe for humans<sup>2,3</sup>. Achrinathrin is an insecticide-acaricide which is not permitted to use in raisin, while lambda-cyhalothrin is permitted to use in wineryard<sup>4</sup>. The aim of this study was to investigate the false positive identification of acrinathrin and determination of the false positive effect of lambda-cyhalothrin analysis in raisin food matrices by using GC-MS/MS on the regards of EN 15662:2018 standard method and QuEChERS method<sup>5,6,7</sup>. Standard addition method was used to identify retention time and to highlight MRM transitions of two pesticides. The result of this study have a great importance in seperating acrinathrin and lambda-cyhalothrin peaks. The seperation studies were based on MRM transition selective and standard addition studies by using GC-MS/MS and double checked with LC-MS/MS.

**Keywords:** QUECHERS method; GC-MS/MS; acrinathrin; lambda-Cyhalothrin.

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## PP-10 Optimisation of Phenolic Compounds and Antioxidant Capacity Extraction Conditions of Lichen Samples Using Response Surface Methodology (RSM)

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Lichens are two different organisms living together in a symbiotic relationship of algal and fungal cells. Some lichens are used as food as well as medical purposes. Lichen secondary metabolites have a wide variety of biological activities that include antimicrobial, antimycobacterial, anti-inflammatory, antioxidant, plant growth inhibitory, enzyme inhibitory and cytotoxic effects.<sup>1,2</sup> In the present study, we applied response surface methodology (RSM), for the first time, to optimize ultrasound-assisted extraction (UAE) of TPC and ABTS from nine lichen samples (*Bryoria*

*fuscescens*, *Evernia divaricata*, *Evernia prunastri*, *Lobaria pulmonaria*, *Platismatia glauca*, *Pseudevernia furfuracea*, *Usnea flipendula*, and *Usnea florida*). The effect of three factors (extraction temperature, extraction time, and solvent concentration) was considered to determine extraction conditions that would maximize the total phenolic content (TPC) and ABTS of ultrasound-assisted extracts of lichen samples. Fourteen different experimental points were obtained by using Design Expert Software. The independent variables (factors) were extraction temperature (25–40°C) and extraction time (5–20 min), ethanol concentration (0–80%), and the responses (dependent variables) were the TPC (mg GAE/g, dry weight dw) and ABTS (μmol/g dw). The effect of the process parameters on the bioactive compounds was determined by quadratic models. Our results showed that the TPC values of all lichen extracts ranged from 0.54 to 16.90 mg/g dw and ABTS values ranged from 1.10 to 319.76 mg/g dw. The highest TPC and ABTS values were obtained for *E. divaricata* at 80% ethanol concentration, 12.5 minutes, and 25 and 40 °C. For lichen samples, the linear and quadratic terms were very significant ( $P < 0.01$ ). The lack of fit was used to assess the model's suitability and was not statistically significant ( $P > 0.05$ ), demonstrating that the model was capable of accurately modeling the experiment's data.

**Keywords:** Lichen; antioxidant capacity; response surface methodology (RSM).

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### PP-11 Evaluation of Time Dependant Oxidation of Some Citrus Flavours with CUPRAC Method and Gas Chromatography Mass Spectrometers

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Flavours are components with smell and taste, which are formed with more than one volatile or non-volatile chemical molecules. These include aldehydes, ketones, ethers, esters, etc. chemicals as main components. Usually they are used in food (Bakery, candy, etc.) and cosmetic (mouth care, lip products, etc.) sectors.

The purpose of this study is to examine the alteration of citrus group flavours shelf lives due to oxidation using the CUPRAC method and GC-MS (gas chromatography mass spectrometry) device. In this study, flavorings that do not contain antioxidants were selected and the raw materials that will be formed due to time-dependent oxidation and oxidation were examined using the GC-MS device.

**Keywords:** Citrus flavours; CUPRAC method.

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### PP-12 Synthesis of Sodium Titanates Using Chitosan in The Environment

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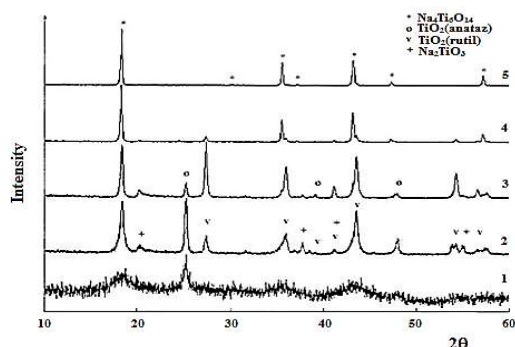
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The method of hydrothermal synthesis was used to obtain titanates with the general formula  $\text{Na}_2\text{Ti}_n\text{O}_{2n+1}$  in the environment. Poly titanates  $\text{TiO}_2 \cdot n\text{H}_2\text{O}$  obtained from titanium concentrate were treated with concentrated aqueous NaOH solution [1]. From Fig.1 It follows that the production of single-phase  $\text{Na}_4\text{Ti}_6\text{O}_{14}$  from  $\text{Na}_2\text{TiO}_3$ , anatase and rutile modifications of  $\text{TiO}_2$  is possible at temperatures above 950K. In the dissertation work, titanates  $\text{Na}_4\text{TiO}_4$ ,  $\text{Na}_2\text{Ti}_3\text{O}_7$  and  $\text{Na}_2\text{Ti}_6\text{O}_{13}$  were also obtained by hydrothermal method, the compositions of which are in accordance with the phase diagram of the  $\text{Na}_2\text{O} - \text{TiO}_2$  system. To desilicate titanium dioxide, the mixture was treated with a weak solution of sodium hydroxide at the boiling point of the solution. Poly titanate acid powder  $x\text{TiO}_2 \cdot y\text{H}_2\text{O}$  was mixed with pure chitosan powder in a mass ratio of 20:1 and calcined in a temperature range of 850-900°C to obtain technical titanium dioxide in the form of a mixture of 94.5% anatase and 4.5% rutile. When calcining poly titanate acid powders  $x\text{TiO}_2 \cdot y\text{H}_2\text{O}$  in the absence of chitosan, technical titanium dioxide mainly consisted of rutile.

The use of chitosan as a modifier is not accidental. We have revealed the influence of a bioactive natural polymer – chitosan as an organic reagent on the formation of the texture morphology and phase composition of products during hydrothermal treatment of  $\text{TiO}_2$  powders [2].





**Figure 1.** Fragments of anatase, rutile,  $\text{Na}_2\text{TiO}_3$  and  $\text{Na}_4\text{Ti}_6\text{O}_{14}$  diffractograms annealed for 6 hours at 650 (1). 750 (2). 850 (3). 950 (4). 1050K (5).

**Keywords:** Sodium titanates; chitosan.

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### PP-13 Chemical Composition and Functional Properties of Cape Gooseberry (*Physalis peruviana* L.) Jam

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Cape gooseberry (*Physalis peruviana* L.), a native of the Andes, is widely cultivated in the Andes and Colombia. Its cultivation is widespread in Asia, Australia, and South Africa. It is known for with its juicy, yellow or orange fruits<sup>1</sup>. It has been scientifically proven that *Physalis peruviana* L. fruit is beneficial for human health with its high physicochemical properties and rich active ingredients<sup>2</sup>. It provides significant health benefits for a variety of chronic conditions, including obesity, cancer, cardiovascular and neurodegenerative diseases as a functional product<sup>3</sup>. Golden berry seeds and pulp/peel includes fatty acids, lipids, triacylglycerols, phytosterols, fat-soluble vitamins, and  $\beta$ -carotene<sup>4</sup>.

This study examined the chemical and physical characteristics of Cape gooseberries grown in greenhouses in the province of Antalya, as well as the jams and marmalades made from this fruit. A six-month period of harvesting was used to measure the fresh fruit's acidity, protein, total sugar, brix, color, pH, vitamin (B1, B2, C), mineral (Mg, Ca, K, Na, Fe, Zn, P), carotene, and total phenolic matter content that is titratable. According to the analysis, it is found that Cape

gooseberry fruit is a good source of vitamins B1 and B2, vitamin C, total phenolics,  $\beta$ -carotene and minerals. The sensory evaluation conducted on samples of jams and marmalades made from the harvested fruits revealed that Cape gooseberries could be used to make jam. The fact that the Cape gooseberry marmalades were the most well-liked kind by the panelists demonstrated that the fruit could be used to make both marmalade and jam.

**Keywords:** *Physalis peruviana*; cape gooseberry.

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### PP-14 Investigation of Essential Oils for Improving the Quality and Shelf Life of Tomato Paste and Tomato-Based Sauces

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Türkiye is an important player in the consumption/sale of tomato paste and tomato sauces in the domestic and foreign markets. Shelf life and preservative additives of these products are among the quality parameters and are important for the consumer. [1] With the changing tomato paste legislation, the use of many additives (such as salt, potassium sorbate) that are suitable for use has been limited. Considering the harms of these substances, which are used to prolong shelf life and increase quality, to human health, it has become a necessity to replace these products with healthier alternatives.

The aim of this study is to develop innovative natural food additives that increase the shelf life and quality of tomato paste and other tomato sauces. Within the scope of this study, it benefits from the antimicrobial properties of spices that are consumed in our country and in the world.

Biological efficacy studies were carried out against strains isolated from tomato sauces and paste. Antimicrobial use and optimal doses of natural vegetable oils were determined against microorganisms isolated and identified by microorganism isolation and identification in different tomato paste and ketchup samples purchased from the market and industry [2]. Antimicrobial synergistic combinations and MIC values of essential oils were investigated. Afterwards,

essential oils with synergistic activity were encapsulated with food grade polymers using different methods in order to provide controlled release and prevent the product from changing the taste [3].

In the light of the results obtained, it is thought that microcapsules containing essential oil can be used as a natural preservative in the preservation of packaged foods.

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**Keywords:** Cape gooseberry; essential oils; tomato paste; tomato-based sauces.

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### PP-15 Effect of Antibiotics on Food Components and Food-Antibiotic Interactions

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The term of safe food has been seen as one of the most important issue affecting the food preferences of consumers in recent years. In this respect, antibiotics and antimicrobials that used as food preservatives constitute the most important risk group. Food-drug interactions can be defined as the decrease in the effectiveness of the treatment, the emergence of toxic and side effects as a result of the decrease in the bioavailability of the drugs taken into the body for treatment due to food intake<sup>[1]</sup>. Some foods and food components can change the absorption, distribution and effect of some drugs taken into the body<sup>[2]</sup>. Antibiotics are secondary metabolites may be obtained from molds. Antibiotics are chemical substances that are widely used for therapeutic purposes, especially in infections<sup>[3]</sup>. Penicillins, cephalosporins, tetracyclines, macrolides, quinolones can be stated as the most common antibiotics groups in terms of food-antibiotic interactions. Acidic foods (caffeine, tomato, fruit juices, grapefruit juice, etc.) and calcium-rich foods (milk and dairy products, etc.) should not be taken together with this antibiotic group<sup>[4]</sup>. The effects of food-drug interactions can differ from person to person. This difference may be caused by the food, beverages, dietary supplements, and other

medications that people consume<sup>[5]</sup>. For these reasons, food-drug interactions should be avoided to prevent unexpected or poor results. This study deals with the effects of antibiotics in the form of residues in food and their interaction with foods on the body when used for treatment.

**Keywords:** Food-antibiotic interactions.

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### PP-16 Detection of Diazepam and Flunitrazepam in Spiked Beverages

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Drug-facilitated crimes (DFC) are defined as crimes such as robbery, sexual assault, money extortion or battery when committed while the victim is under the influence of drugs<sup>1</sup>. Diazepam (DIA) and Flunitrazepam (FLU) are frequently used in drug-facilitated crimes, due to their short duration of action and easy availability<sup>2</sup>. Tasteless, colorless and soluble character of these substances, makes it easier to commit crimes by added to the drink or food of the victims<sup>3</sup>. It is crucial to develop new methods that can evaluate the presence of drugs frequently use in DFC crimes in alcohol residues or contaminated material to prove acts connected with crime<sup>4</sup>. This work aims to develop a technique using high-performance thin-layer chromatography (HPTLC) for the simultaneous determination of DIA and FLU in spiked beverages. Although DIA can be detected in various beverages by HPTLC in previous studies<sup>2</sup>, this developed method can determine DIA and FLU together in spiked beverage samples simultaneously for the first time. Moreover, HPTLC has an advantage which allows samples to be analyzed directly, while current chromatographic methods require sample pretreatment to detect these two substances. The HPTLC setup used included an automatic TLC Sampler 4, an automatic developing chamber, a TLC Scanner 3, and precoated silica gel 60 F254 HPTLC glass plates (20x10cm). The bandwidth was each adjusted at 6 mm and the injection volume was 2 µL. The loaded plates were developed up to 80

mm with 7 mL Hexane-Ethyl Acetate-Glacial Acetic Acid (7:2,5:0,5) mobile phase in an unsaturated twin trough glass chamber; they were dried for 5 min. Bands were quantified in single-wavelength reflectance mode and evaluation was carried out by measuring the peak areas with linear regression. Multi-wavelength scanning was performed in the 200–400 nm range at 20 nm s<sup>-1</sup> with a data resolution of 1 nm per step. The linearity range was between 6-50 ng/spot for both drug substances. By using this method, it will be possible to identify and analyze the evidence found at the crime scene which contaminated with these two active substances in trace amounts. This study is capable of providing valuable information for routine analysis, and it will serve the interests of justice by verifying the findings.

**Keywords:** Diazepam; flunitrazepam; spiked beverages; HPTLC.

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### PP-17 Oleogels and Their Utilization in Food Industry

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In recent years, the studies have been carried out to prevent health problems caused by the high amount of fat content of food products. The studies that focused on oleogels are one of these studies. By these works, it is aimed to reduce the amount of trans fats and saturated fats. Oleogel is defined as a gel form with a continuous, thermo-transformative and three-dimensional network structure formed by asymmetrical crystallization or self-aggregation of an oleogelator with low

molecular weight and limited solubility in a consumable vegetable oil. Oleogels can be used in chocolate, bakery products, fat industry, meat products and cosmetic industry. Oleogels show structural effects similar with saturated fats by their rheological properties such as taking shape ability and elasticity. While ensuring emulsion stability, it also prevents the separation of oil globules from the emulsion by providing a superficial active connection between two different liquids that do not mix like emulsifiers. For these, it is important to research the effects of oleogels on chemical and biochemical compositions of foods, and especially their functional properties.

**Keywords:** Chocolate; emulsifier; oleogel; trans fat.

### PP-18 Some Physicochemical Changes in Commercial Virgin Olive Oils (Ayvalık and Memecik cv) Exposed to Daylight and Dark

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In this study, a sample set consisting of commercial virgin olive oil (CVOO) produced from Ayvalık and Memecik cultivars produced by a conventional hydraulic pres **classical hydraulic press** [wet system] (stone mill [approx. 40 minutes at 25–27°C] crushing, first pressing in natural or synthetic sacks [100–150 kg/cm<sup>2</sup> without using hot water], second and – sometimes – third pressing [addition of hot water at 70–80°C and under pressure of 200–250 kg/cm<sup>2</sup>], oily juice [at 5500–6500× g speed] vertical separation or natural decantation) and **three-phase continuous system** (the mostly common system in Türkiye, crushing with metal disc or hammer crusher, kneading in a malaxator [with the addition of water at 40°C for 30–40 minutes], in a horizontal centrifuge [3500–4000× g decanter] separation into oil, (with oily must [5500–6500× g speed] vertically separated), black [waste] water and pomace) was used. CVOO samples of Ayvalık (North Aegean locations, especially some northern districts of İzmir, Edremit Gulf basin in Balıkesir province) and Memecik (South Aegean locations, especially some southern districts of İzmir, Aydın and Muğla provinces) were important economically domestic olive cultivars of Aegean region, providing approximately 65 % of virgin olive oil production of Türkiye. CVOO samples were geographically coded as Northern (NA) [Ayvalık variety] and Southern Aegean (SA) [Memecik] oils. The totally 8 CVOO samples from two domestic olive cultivars placed in PET (Polyethylene terephthalate) bottles were wrapped with aluminium folios (F [dark] n=4) and stored in a transparent (T n=4) form -generally- at room temperature (20±2 °C) and exposed to diffused daylight in two separate ways (T and F) for one year. While the linoleic acid (LO) [8.46 – 10.05 %] value of SA samples was lower in NA samples [10.60 – 10.86



%], the Oleic acid (OLA) value of SA samples [72.86 - 75.05%] was higher than that of NA samples [71.27 - 71.74 %]]. Without storage types (transparent and folios), it was observed that OLA (MUFA) and linolenic acid (LNO) values of all samples increased, while LO, PAM and MUFA/PUFA (oxidative stability indicator) decreased after one year of storage. Without olive cultivars and oil extraction systems, it was also observed that the remarkable changes of major cis fatty acid components of all oil samples were in the transparent (T) groups exposed to daylight.

**Keywords:** Virgin olive oils.

### PP-19 Development of Ice Cream Enriched with Collagen

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In line with the changing and developing world conditions, consumers, whose awareness of consumption has increased, are turning to foods that are beneficial to health in order to lead a healthier and higher quality life.<sup>1</sup> The need for innovative approaches to improve the functional qualities of long shelf-life dairy products, which have a rich nutritional content such as ice cream and are frequently preferred by consumers from all age groups, is also increasing.<sup>2,3</sup> In this context, collagen can be considered as a new alternative to produce new ice cream products that can contain bioactive compounds with therapeutic properties and also have structure-improving properties in the food matrix. The present study aimed to develop a protein-rich functional ice cream prepared by adding collagen at different rates as 3%, 6% and 9% and investigate collagen effect on functional, textural and sensory properties of ice cream. Our results showed that the dry matter of the ice cream samples varied between 35.34% (control ice cream) and 39.13% (ice cream enriched with 9% collagen). The addition of collagen into ice cream significantly improved texture properties such as hardness, gumminess and durability in direct proportion to increasing rates. Protein content of 2.3% in the control sample, increased up to 11.1% with the addition of collagen. The overrun value, which was 44.74% in the control ice cream sample without collagen, increased dramatically with the addition of collagen, and the highest overrun value (53.97%) was measured in the ice cream with 9% collagen supplement. According to the sensory evaluation results consisting of parameters such as color, taste, aroma, melting in the mouth and gummy structure, the ice cream produced with the addition of 3% collagen was the most preferred ice cream. Collagen enrichment had a very strong effect (26.9, 27.8 and 32 mg trolox equivalent (TE)/100 g) on the antioxidant capacity of the ice cream samples at all rates in which it was used and exhibited a considerably DPPH radical

scavenging effect compared to the control ice cream sample (2.31 mg TE/100 g).

**Keywords:** Ice cream; collagen.

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### PP-20 The Changes of Fatty Acid Profiles in Oils of New Turkish Olive Hybrids (*Manzanilla x Ayvalık*, *Manzanilla x Uslu* and *Gemlik x Gordal*) developed by Controlled Crossbreeding Method

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Olive breeding, covering clonal selection and controlled crossbreeding methods, is the one of important ways in improvement of virgin olive oil quality. This investigation was carried out with totally 13 hybrids and 2 parents during 2015 – 2019 (three) crop years and these new olive genotypes were obtained by a controlled crossbreeding method from “*Manzanilla*, *Uslu* and *Ayvalık*” (table & oily) [6 hybrid samples + 3 parents] “and “*Gordal* and *Gemlik*” (table) [3 hybrid samples + 2 parents] economically domestic olive varieties. The oil extraction of olive hybrid and parent samples, grown in the same pedoclimatic conditions (Kemalpaşa – İzmir/ Türkiye), was carried out by Abencor centrifugation method (ACM, a small laboratory scale equipment developed based on three phase centrifugation. The changes of the fatty acid profile and their parameters during four harvest years (2015–2019) were found in this order as group means: Oleic acid (OLA) 66.08 - 76.07 % [ *Manzanilla* x *Ayvalık* combination ], 68.66 - 71.19 % [ *Manzanilla* x *Uslu* samples] and 61.01 - 72.83 % [ *Gemlik*



x Gordal hybrids]; linoleic acid ( LO) 7.53 - 16.10% [Manzanilla x Ayvalık combination ], 6.88 - 12.89% [Manzanilla x Uslu samples] and 7.92 - 16.10 % [Gemlik x Gordal hybrids]; palmitic acid (PAM) 11.46 - 16.22 % [Manzanilla x Ayvalık combination], 10.07 - 16.78 % [Manzanilla x Uslu samples] and 12.95 - 15.97 % [Gemlik x Gordal hybrids]; , linolenic 0.63–1.07 % for all combinations, stearic 1.53–2.77 % for all hybrids; SFA .14.74 - 18.93 % [ Manzanilla x Ayvalık combination ], 13.31-20.24% [Manzanilla x Uslu samples] and 16.38 - 18.87 % [Gemlik x Gordal hybrids]; MUFA 67.65 - 76.92 % [Manzanilla x Ayvalık combination ], 69.99- 76.27 % [Manzanilla x Uslu samples] and 64.41 - 75.34% [Gemlik x Gordal hybrids]; PUFA 8.20- 13.25 % [Manzanilla x Ayvalık combination ], 7.56 - 13.95 % [Manzanilla x Uslu samples] and 8.93 - 17.0 % [Gemlik x Gordal hybrids]; oleic/linoleic and MUFA/ PUFA (oxidative stability indicator) 3.92 - 21.58 and 3.85 - 12.67, respectively; Quality Index (OLA/PAM+LO) 1.93 - 4.82 ([<3.9] score of 7 hybrids and [4 - 4.9] score of 2 hybrids). When the results were evaluated, it was determined that fatty acid composition of most samples were generally –except a few samples for LO and LNO-conformable to the limits with IOC and Turkish Food Codex.

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## PP-21 Gelation and Particle Formation in High Protein UHT Flavoured Milks During Shelf-Life

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The heat treatment to milk at ultra-high temperature (UHT) for a short time, and combining this with aseptic packaging provides advantages for the product such as longer shelf-life in room temperature for several months [1]. However, the UHT process which is applied in order to extend shelf-life in milk may cause age gelation and particle formation during the storage period because of physical and/or enzymatic activities. Age gelation and particle formation may occur from several factors such as; the mode and severity of heat treatment, proteolysis, microbiological quality of raw milk, storage temperature and additives [2, 3]. For this purpose, we have taken into consideration these variables, in line with the needs of industry related to age gelation and particle formation problem in UHT high protein milk during shelf-life. Our results showed that we can prevent the gelation and particle formation by applying to proper temperature/time parameters and combining it with our additive formula; stabilizer&emulsifier blends.

**Keywords:** Gelation; UHT process; shelf-life.

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## PP-22 Development of Functional Powder Drinks with Inulin Addition Suitable for Fast Consumption Using Lyophilized Kefir Culture

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In this research, it was aimed to obtain a functional food with increased nutritional value by using different inputs. The product is designed to be a different alternative to fermented products and to be a very good solution for consumers who want to try fast consumed alternatives. In order to increase the functional value of the product, powder mixtures were prepared by adding 1% (w/v) and 2% (w/v) inulin, which is known as a prebiotic, and kefirs prepared from these mixtures were investigated physically, chemically, microbiologically and sensorially [1]. In this study, titration acidity, pH value, *Lactobacillus* spp., *Lactococcus* spp. and yeast numbers, viscosity value were determined during the storage period. At the same time, the initial total oil and dry matter values of the samples were measured. With sensory analysis, texture and taste parameters were evaluated primarily. Viscosity values at the end of shelf life of powder mixtures with no inulin addition, 1% (w/v) and 2% (w/v) inulin are 325.5±0.14, 361.1±0.12 and 408.3±0.1 respectively. In the microbiological evaluation made at the end of fermentation, *Lactobacillus* spp. counts 8.05±0.05, 8.37±0.07, 8.73±0.03 *Lactococcus* spp counts 9.21±0.09, 9.41±0.07, 9.86±0.05 Yeast 4.9±0.13, 5.23±0.08, 5.77±0.03 logKOB/ml were determined.

**Keywords:** Kefir; food innovation; inulin; probiotics; prebiotics.

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## PP-23 Assessment of in Vitro Cytotoxic and Cytostatic Anti-Skin Cancer Properties of Fustin Isolated from *Cotinus Coggyria* Scop.

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Fustin is one of the main flavonoids isolated from the heartwood of Eurasian Smoke Tree (*Cotinus coggyria* Scop., Anacardiaceae), a medicinal plant widely applied in the Balkan folk medicine. Fustin possesses numerous biological activities, such as anti-inflammatory<sup>1</sup>, antioxidant, gastroprotective, etc.<sup>2</sup>. Regarding its anticancer properties, the flavonoid is very poorly studied. The present research aimed to assess the *in vitro* cytotoxic and antiproliferative potential of fustin isolated from the heartwood of *Cotinus coggyria* against two human skin cancer cell lines: squamous cell carcinoma (A431) and malignant melanoma (A375), and to compare these effects with the cell viability and growth inhibitory capacity on normal dermal cell line (BJ). The cytotoxic and cytostatic qualities of the flavonoid were investigated through MTT assay and microscopy observation of cell morphology after 24 h and 72 h cell treatment in a wide range of concentrations. The obtained results disclosed that fustin exhibited more pronounced antiproliferative than cytotoxic properties towards A375 and A431 skin cancer cell lines. A lack of cytotoxic and a slighter cytostatic activity against the normal BJ cell line in comparison to the cancer cells was established. It could be concluded that fustin isolated from *C. coggyria* possesses anti-skin cancer properties against A375 and A431 cell lines which will be further studied in details.

**Keywords:** *Cotinus Coggyria*; anti-skin cancer.

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## PP-24 Nutritional Properties of Snacks Enriched with Avocado Seeds

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Avocado (*Persea americana* L.) is an important tropical fruit, source of bioactive compounds. It is native of Mexico and Central America, but they are cultivated around the World. In avocado processing, seeds are removed as wastes. The avocado seed characterized about 13 to 24% of the total weight of the fruit and it source of different bioactive compounds such as phenolic compounds, procyanidins and triterpenoids. However, this by-product has limited commercial uses<sup>1,2,3</sup>.

In the study, it was aimed to use in avocado seed as a functional component in snack production and to determine the physico-chemical and functional properties of the products obtained. Total phenolic content (TFM) was analysed using Folin–Ciocalteu assay, and antioxidant capacities were assessed by CUPRAC and DPPH methods. According to the results, enrichment of avocado seeds had improved functional quality of cookies by increasing total phenolic contents, antioxidant capacities, and dietary fibre content of snacks. The results demonstrated that avocado seed might be use as a natural additives and have a good potential for developing functional and acceptable snacks and similar bakery products.

**Keywords:** Avocado seeds; total phenolic content (TFM); Folin–Ciocalteu assay; antioxidant capacities.

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## PP-25 The Effect of Different Dough Yields During Rye Sourdough Fermentation with *Lactobacillus Plantarum*

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The sourdough technology is considered to be one of the oldest biotechnological processes used to obtain cereal-based foods.<sup>1</sup> The growth of microorganisms is affected by process parameters such as the flour type, temperature, redox potential and dough yield.<sup>2</sup> Due to its effect on microbial diversity, dough yield (DY = [flour weight + water weight] x 100/flour weight) significantly affects the progress and outcome of sourdough fermentation.<sup>3</sup> Lactic acid, which is the main metabolic product of microorganisms in sourdough, its concentration and the corresponding decrease in pH level and total titratable acidity (TTA) are generally used as a control parameter in industrial sourdough production.<sup>1,4</sup> In this study, *Lactobacillus plantarum* was used as a starter culture in rye sourdough fermentations and the influence of DY (340, 290 and 240) in terms of pH, TTA (ml NaOH 0.1 N/10 g dough), lactic acid (%) and soluble sugar (maltose + glucose, %) was analyzed throughout 24 hour. According to experiment results, lactic acid increased with increasing DY and 5,07±0,52%, 6,15±0,15% and 6,93±0,32% lactic acid were produced for 240, 290 and 340 DY, respectively. Compared to the 240 DY, the TTA increased by 7% on the 290 DY and by 15% on the 340 DY. This is explained by the fact that the amount of dissolved sugar is higher in dough mixtures with high DY. Nutrients are better used by the LAB in fluid (high DY) sourdough compared to firm (low DY) sourdough<sup>5</sup>, therefore TTA was found higher. Moreover, a higher lactic acid value was found compared to the low DY, since the high DY provides better diffusion of the produced organic acids to the environment<sup>1</sup>.

**Keywords:** *Lactobacillus plantarum*; sourdough; dough yield; total titratable acidity.

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## PP-26 Potentials of Berry Fruits Pomaces for Bio-Based Films

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Nowadays, there are new approaches and goals for packaging materials for advantages on foods and friendly properties on environment. For these purposes, biodegradable polymers are much preferred to replace conventional polymeric goods in packaging applications. Biopolymers, such as carboxyl methyl cellulose (CMS), environmentally friendly sustainable plastic alternatives. The worldwide need for bioplastic as an alternative for conventional plastics because of their nontoxicity, biocompatibility, renewability, and biodegradability properties. They are commonly produced using different raw materials (proteins and polysaccharides), which are mostly derived from plants (cellulose-based plastics and starch derived plastics), and microbial sources. Moreover, there is more than a need to preserve natural resources and to reduce plastic waste materials by replacing them by bio-alternatives. It should be solution that wasted foods, which are the GRAS, should be a source for enriching biopolymers with their valuable bioactive compounds. Fruits and vegetables, especially berries that contain high content of valuable bioactive compounds, can be used for enriching to biopolymers and for production of active films and indicators. It has high importance for food science because oxidation and microbial contamination present major problems that influence quality and safety of different products during their storage. Currently, to overcome these points, there are some approaches can be applied. For instance, bioactive compounds and antioxidant agents from berries can be directly added to biopolymers. Blueberries, red and purple grape, black mulberries etc. and their industrial wasted present good sources of antioxidants, non-flavonoids and flavonoids. Phenols were mostly found in the skin and pomace of berries. It is known that most of the phenols were generally wasted because of the poor extraction during the fermentation. Therefore, these wastes have high importance for biofilms. However, it should also be investigated the



effect on some other properties, such as texture, taste, solubility etc.

**Keywords:** Antioxidants; enriched biopolymers; carboxyl methyl cellulose (CMS); packaging materials; sustainable plastic alternatives.

## PP-27 Dye-Doped Polymeric Film Synthesis and Characterization

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Polymers are long-chain, high-molecular-weight compounds formed by a large number of identical or different atomic groups linked more or less regularly by chemical bonds and have a very important place in our lives compared to ancient times.<sup>1</sup> The reason why polymers occupy such a place in our lives is due to their cheapness, light weight, easy shaping, resistance to chemicals and generally not being brittle. To produce polymeric films; solution casting, cast film extrusion, blow molding, sol-gel coating methods pressure or vacuum thermoforming like methods are used.<sup>2</sup> In recent years, research and development activities in both public institutions and private sectors have gained great momentum due to the use of polymeric films in almost every field. Polymer structured films are frequently used primarily in food products, consumer goods, and liquid and bulk chemical and petrochemical products, as well as in household packaging materials.<sup>3</sup> Therefore, the interest in environmentally friendly polymers that do not harm the nature and can decompose in nature is increasing day by day. In this study, it is aimed to synthesize pure and dye-doped polymer films by doping  $\beta$ -Carotene which is natural dye, with polyvinyl alcohol (PVA) amounts varying between 1%-5% wt and to carry out characterization studies of the produced films. PVA is a water-soluble synthetic polymer obtained by polymerization of vinyl alcohol.  $\beta$ -Carotene is an organic, strongly colored red-orange pigment abundant in fungi, plants and fruits. It is very advantageous to use the casting method to produce a dye-doped polymeric film that is completely compatible with nature, will reduce waste generation, economical and it can be used in different industries. In order to synthesize pure PVA films, different PVA amounts between 1%-5% wt were dissolved in pure water at 85 °C for 4 hours. Then, these solutions were poured into petri dishes and dried at 40 °C for 48 hours. Dye doped PVA films were produced by dissolving  $\beta$ -Carotene in 1%-5% wt of PVA solutions by mixing for 1 hour. Then, obtained solutions were centrifuged at 4000 rpm for 15 minutes to ensure more homogeneity. After centrifugation, the doped films were dried again at 40 °C for 48 hours. Finally, Fourier transform infrared spectroscopy and X-ray diffractometry tests of 3% by weight film were made from the pure PVA

films produced. Characterization tests of other pure and dye-doped films are carried out.

**Keywords:** Dye-doped; polymeric film synthesis; characterization.

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## PP-28 Development and Validation of A Fast Multi Residue Method For 15 High Polar Pesticides in Tomato Samples Using LC-MS/MS

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The high polar chemicals, such as aminomethylphosphonic acid, bromate, bromide, chlorate, chlormequat, cyromazine, diquat, ethephon, fosetyl-al, mepiquat, N-acetyl-glufosinate, perchlorate, phosphonic acid, propylene-thiourea and trimethyl sulfonium, are plant growth regulators, fertilizers, pesticides or pesticide metabolites. Their residual level in fresh foods is regulated in European Union and Türkiye. But, direct analysis of these compounds have always been challenging since they cannot be extracted easily using Quick Polar Pesticides Extraction (QuPPE) method<sup>1</sup>. Unstable retention times and chromatographically very long detection periods are the other major problems of the analysis<sup>2</sup>. It is necessary to develop a more rapid and robust chromatographic analysis method. In this study, a multi-residue analysis method was developed and verified for the detection of polar compounds in tomato matrix using LC MS/MS. The compounds were extracted using a methanol-based very short sample preparation method. All 15 compounds were analysed simultaneously in a single run with a total analysis period of less than 4 minutes though changing column specification and buffer formulation. The validation data of all compounds obtained in LC-MS/MS analysis was quite reliable and were in line with the SANTE 11312/2021 Guideline<sup>3</sup>. Calibration results for 6 concentrations from 10 to 400  $\mu\text{g kg}^{-1}$ , showed good linearity ( $R^2 = 0.990 - 0.999$ ). In addition, interference and retention time shift were not detected. Average recovery rates were between 84.03 and 119.65% for all compounds, when tested with 10 and 50  $\mu\text{g kg}^{-1}$  concentrations, respectively. The maximum RSD values



of repeatability (RSD<sub>r</sub>) varied between 0.74 and 18.31% for same concentrations of the compounds. The maximum RSD values of reproducibility (RSD<sub>WR</sub>) for same concentrations were between 2.94 and 18.62%. Low LOQ values (6.00 to 8.09 µg kg<sup>-1</sup>) were achieved for all compounds. The validated LOQ values were under the lowest Maximum Residue Limits of European Union of the compounds for tomato sample. This study was funded by Perla Fruit Company with the grant number ULUTEK STB079417.

**Keywords:** Pesticides; tomato samples; LC-MS/MS; Quick Polar Pesticides Extraction (QuPPE) method.

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## PP-29 Investigation of The Changes in Chemical Composition of Different Fingered Lemons Grown in Türkiye and Subjected to Different Extraction Techniques

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Finger lime (*Citrus australasica* F. Muell.), also known as caviar lime, is one of the six citrus species native to Australia. Finger lime is a unique native Australian citrus species with a distinctive phenotype. This semi-wild citrus species was

known for its finger-like shape and caviar-like juice vesicles. Finger limes are becoming increasingly popular, and the demand for this fascinating fruit is on the rise. However, unlike many reports on other citrus species, there are no studies on the physicochemical properties of finger lime species grown in Türkiye. Therefore, this study was conducted to shed light on some of the chemical properties of this unique citrus species.

Four different finger lime samples (Green faustrime, Red champagne, Rick's red, and Mia rose) were studied in this research. Equal amounts of fresh samples were cut into small pieces and dried in an oven (at 50°C for 90 min). A total of eight samples were obtained by extraction using the maceration technique and ultrasonic device. Accordingly, the solvent of hexane was used to extract fatty acids. 100 mg of the extract was dissolved in 10 mL of hexane, and 100 mL of 2N methanolic KOH was added. The samples were centrifuged and filtered through a 0.20 µm filter. Fatty acid methyl esters were analysed by gas chromatography-mass spectrometry (GC-MS).

The results were compared by testing four different finger lime samples extracted using two different techniques. According to the composition of fatty acids, oleic acid (C18:1), palmitic acid (C16:0), linoleic acid (C18:2), and linolenic acid (C18:3) were determined as primary fatty acids in finger lime samples. The amounts of primary fatty acids differentiated from each other.

**Keywords:** *Citrus australasica*; fingered lemons; GC-MS.

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**PP-30 Investigation of The Chemical Composition Changes in *Citrus Medica* L. Var. *Sarcodactylis* with Different Techniques**

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Various oils obtained from the fruits, peels, flowers, and seeds of different *Citrus* species are used in many fields, including medicine, food, cosmetics, and textiles.<sup>1</sup> *Citrus medica* L. var. *sarcodactylis*, belonging to the Rutaceae family, originated in India and spread to other parts of the world following the routes of civilisation.<sup>2</sup> In China, it is known as fingered citron or fo-shou (Buddha's hand) and is used in traditional medicine as a tonic, antispasmodic, antiemetic, expectorant, and inhaler.<sup>3</sup> Considering the importance of fatty acids in daily human diets, no study has been reported on the fatty acid composition of *Citrus medica* L. var. *sarcodactylis*, a newly cultivated fruit in Türkiye. Therefore, this study investigated the effects of modern drying techniques on the fatty acid composition of *Citrus medica* L. var. *sarcodactylis*.

Equal amounts of fresh samples, divided into small pieces, were dried using the oven, lyophiliser, and microwave. Accordingly, the solvent mixture of hexane was used to extract fatty acids. 100 mg of extract was dissolved in 10 mL of hexane, and then 100 mL of 2N methanolic KOH was added to the mixture. The samples were centrifuged and filtered through a 0.20 µm filter. Fatty acid methyl esters were analysed using gas chromatography-mass spectrometry (GC-MS) to compare the fatty acid profile of three different drying techniques. The amounts of primary fatty acids, namely, linolenic acid (C18:3), linoleic acid (C18:2), oleic acid (C18:1), and palmitic acid (C16:0), differentiated from each other.

**Keywords:** *Citrus medica*; fatty acid; GC-MS.

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**PP-31 Evaluation of Mental Health Ingredients**

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Food consumption habits and food selection criteria vastly changing over the globe. Especially in recent years, consumers prefer foods that contain functional components beneficial to their health. With the increase in the demand for functional foods in recent years, the need to produce products that can meet this demand and evaluate the raw materials used in foods in this direction has emerged in the food industry. The expected effect from these functional components is not only to improve body health and strengthen immunity, but also to improve mood and provide mental well-being. In this context, it was aimed to evaluate the use of various mental health ingredients as a functional component in foods, in this review. These components were evaluated in two categories as Stress Relief & Mood Booster and Cognitive Health & Brain Function. GABA, Magnesium, Psychobiotics, L-Tryptophan, Lavender, Turmeric were reviewed among the Stress Relief & Mood Booster supporting food ingredients. Among the Cognitive Health & Brain Function supporting components, L-Theanine, Matcha, Ginseng, Omega-3, Caffeine and Ginkgo Biloba were examined. Studies have shown that these components are effective in supporting brain function, improving cellular health and well-being, contributing to improving attention, thereby improving working memory and executive functions. This reveals the relationship between food and mental health. As a result, studies reveal the relationship between food and mental health, which shows that choosing appropriate food can contribute to improving mood.

**Keywords:** Mental Health; functional ingredients; well-being; brain function; food.

**PP-32 The Effect of Social Media Marketing on Organic Food Purchasing Behavior of Consumers****Author:** Eda Yetimoglu<sup>1,2</sup>**Affiliation:** <sup>1</sup>Üsküdar University Vocational School of Health Services Pathology Laboratory Techniques; <sup>2</sup>Beykent University Graduate Education Institute Business Management PhD Student

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Increasing awareness of people in Türkiye and their desire to protect both their own health and the environment increase the demand for organic foods. Therefore, they use digital platforms to reach safe organic food.

Internet the intensive use of the internet, businesses have had the opportunity to reach their customers in a shorter time, to promote their brands through social media, and to carry out brand activities with lower budgets. Before purchasing a product or service, customers have the chance to make a preliminary assessment by examining the comments and opinions of people who have used the product or purchased the service before via social media (Mills 2012, 160).

The demand for organic food is increasing day by day in Türkiye. Therefore, in this study, it is aimed to determine the factors that consumers pay attention to when buying organic food and to measure the behavior of accessing organic food through social media in order to gain a competitive advantage among organic food producers.

A quantitative research method was planned for this study. Within the scope of the research, a questionnaire will be applied to consumers residing in Istanbul and using unpackaged organic food. While creating the survey, "Consumer Purchasing Behavior" and "Consumers' Social Media Tendency" scales will be used. An online survey will be conducted.

By researching the relationships of social media advertisements, content, and comments of consumers who have purchased organic food before in providing consumers with access to organic food through social media, the effective use of social media and the ways that producers will follow in providing competitive advantage will be determined and suggestions will be put forward.

**Keywords:** Social media marketing; organic food; consumer purchasing behavior; consumers' social media tendency.

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