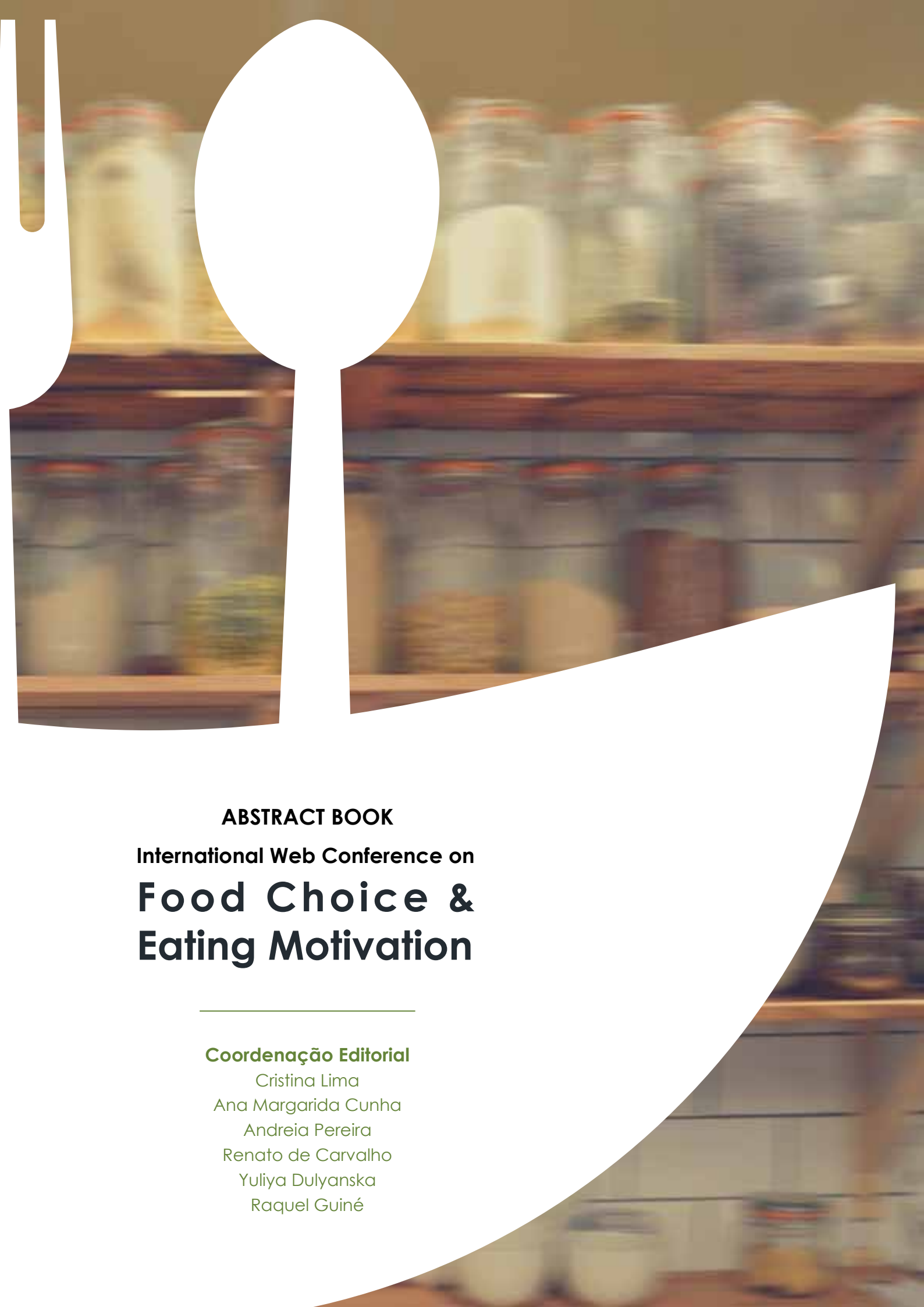

ABSTRACT BOOK

International Web Conference on

Food Choice & Eating Motivation

Coordenação Editorial

Cristina Lima

Ana Margarida Cunha

Andreia Pereira

Renato de Carvalho

Yuliya Dulyanska

Raquel Guiné

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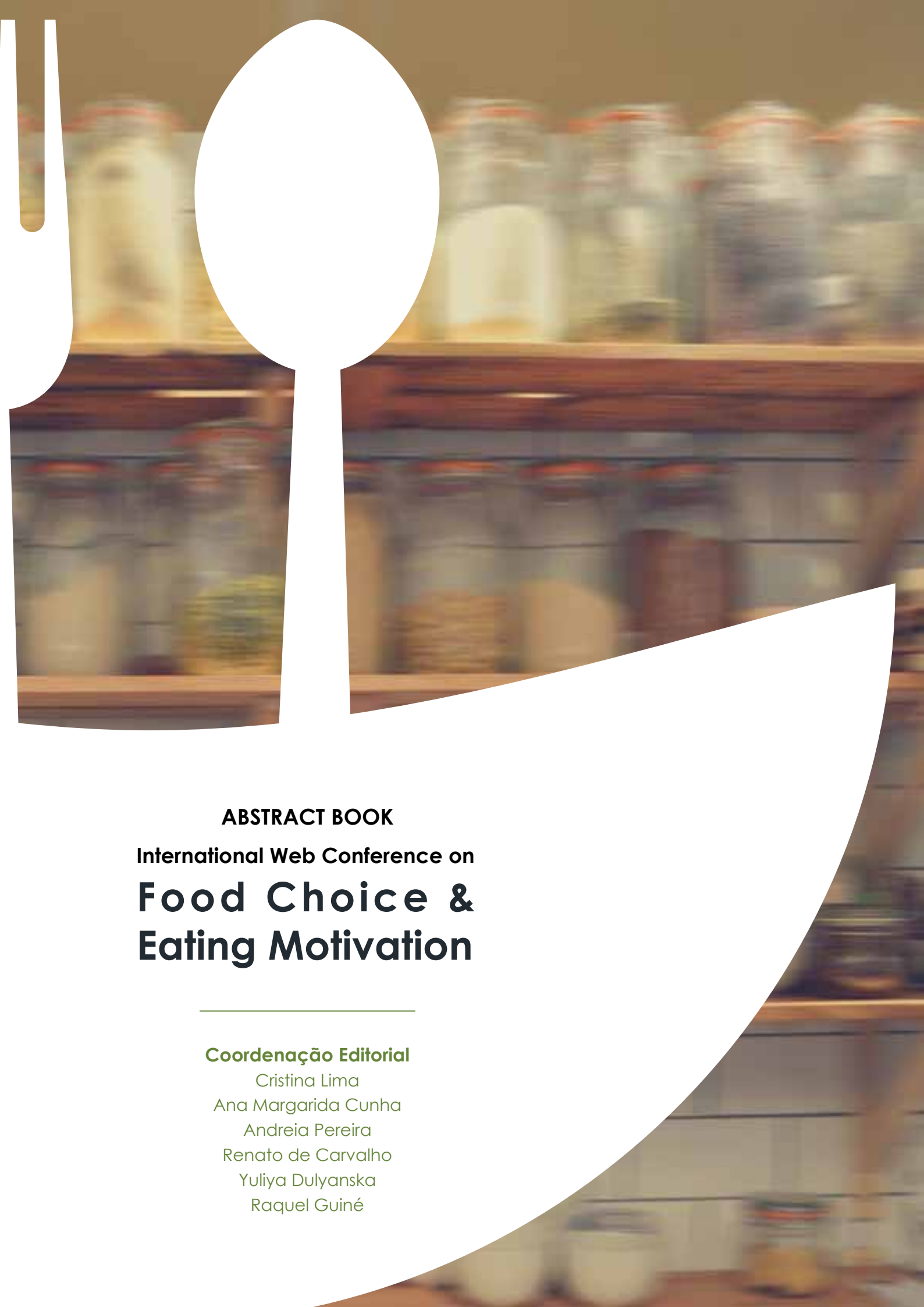

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Editorial

The International Web Conference on Food Choice & Eating Motivation took place online between 19th and 20th May 2022 and was organised by the CERNAS-IPV (Research Centre Centre for Natural Resources, Environment and Society), one of the Research Units of the Polytechnic Institute of Viseu. The scope of the conference was within the domain of Food Science and included different thematic areas related to the consumer science and food choice: Eating Motivations, Determinants of Food Choice, Trends in Food Science, Food Properties, Sensory Science, Gastronomy, Diet and Nutrition, Bioactive Ingredients, Functional Foods and Nutraceuticals, Food Safety Concerns, Food Security and Sustainability.

Consumers need to have foods available on the market that meet their expectations and which they valorise, either for their nutritional value, their organoleptic characteristics, or even their perceived benefits for human health and well-being. Industrials must, therefore, develop foods that satisfy consumers and that effectively comply with all necessary requirements for food quality and safety, as well as possible allegations, which can be an effective marketing tool. Furthermore, people's eating habits are influenced by many factors, of different nature, and the knowledge of these factors and their interconnections can help to understand consumer trends and promote the evolution of the food industry and the academia as supporters for the development of more valuable foods in the present and for the future.

With this in mind, 124 food scientists from 29 countries were engaged in the FC&EM conference throughout the two days, presenting and discussing their work. The program included two plenary talks, three keynote speeches, 46 oral presentations and 35 poster communications.

The first plenary communication, by Professor Ilija Djekic, from the University of Belgrade (Serbia), was about the "Role of food safety tools in supporting the food supply chains". Today's requirements for food supply must undergo strict regulations that aim to protect consumers from hazards and ensure safe and effective transformation of the food products from the primary production until they reach the final consumers.

The second plenary communication was by Professor Edite Teixeira de Lemos, from the Polytechnic Institute of Viseu (Portugal), titled "The Mediterranean Diet: a dietary pattern or a Medical Prescription?". It is well acknowledged the role of the Mediterranean Diet in the prevention of non-communicable diseases and its beneficial effects on health and well-being. This dietary pattern, traditional to the peoples in regions around the Mediterranean Sea, has been recognised by the United Nations and was inscribed in 2013 on the Representative List of the Intangible Cultural Heritage of Humanity.

Professor Cristina Chuck-Hernández, from the Technologic Institute of Higher Studies in Monterrey (Mexico), gave the first keynote speech, titled "Consumer perception about entomophagy in a megadiverse country", devoted to the practice of eating insects in a country with multicultural influences. In Mexico, there are some regions where entomophagy is traditional and other areas where insects are not so common as human food. This problem also mirrors the asymmetries between the world's countries, since there is a great diversity of cultures with different degrees of acceptability toward eating insects. These have emerged in the last decades as a more sustainable alternative to other sources of animal protein, but some neophobia still poses relevant challenges, particularly in western cultures.

The second keynote communication, presented by Professor Manuela Pintado from the Catholic University of Porto, Centre for Biotechnology and Fine Chemistry (Portugal), was about antioxidant fibre as a key bioactive in the valorisation of food plant by-products. Dietary fibre contains relevant amounts of natural antioxidants, particularly phenolics, which are associated with compounds that are not digested along the gastrointestinal system. The antioxidant effect of these compounds is linked with beneficial properties like prevention of lipid and protein oxidation, improvement in quality, stability and free radical quenching capacity, and several related health benefits. The polyphenols bound to the fibre are more protected against processing effects, as temperature treatment, but in the intestine are released by enzymes, thus being highly available, more than free polyphenols.

The last keynote speech was given by Professor Otilia Bobis, from the University of Animal Sciences and Veterinary Medicine Cluj-Napoca (Romania), and concerned “Bee products as valuable source of nutrients and bioactive compounds. Normal or functional foods?”. Bees are a major element with a pivotal role in the environment as pollinators, but they also provide us, humans, with valuable products that, besides their nutritional value, contain important bioactive compounds that help promote human health.

We believe that the program of this conference allowed the enrichment of all participants, with valuable invited speeches, oral communications, e-poster presentations and discussion moments. It constituted a valuable opportunity for exchanging experiences, enhancing knowledge, and establishing possible future cooperation among food scientists worldwide. On behalf of the Organising Committee, I thank the support from the Polytechnic Institute of Viseu and CERNAS Research Centre, and congratulate all participants, presenters and listeners, for having chosen to engage in this scientific event.

The Coordinator of the
Organizing Committee of the FC&EM
Raquel Guiné
Polytechnic of Viseu, ESAV, CERNAS/IPV, Portugal

Plenary Communication

Keynote Communication

Oral Communication

Oral Communication

Poster Communication

Poster Communication

Authors

Plenary Communication

ROLE OF FOOD SAFETY TOOLS IN SUPPORTING THE FOOD SUPPLY CHAINS

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In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 10-10)

This presentation provides an overview of food safety tools that have been introduced lately expanding the perspective from food, food processes and food safety systems to food supply chains. Latest research reveals the need to put into force new food safety legislation focused on controlling maximal allowable values of potential chemical and microbial hazards, as well as presence of toxic elements in food packaging. In parallel, since healthy diets are in focus, this transition led to the need for developing new / modified food labels emphasizing nutritional and health claims. New technological breakthroughs - use of non-thermal food processing technologies and implementation of Food Industry 4.0 bring additional food safety challenges that must be addressed.

Food safety culture, defined as attitudes, values and/or beliefs at a food company level associated with the importance of food safety is a new perspective outlined in food safety management systems. When food safety perspective is elevated to food supply chains, new tools are developed for the purpose of analyzing food safety risks from a holistic approach. First is the 'food safety objectives' concept aiming at preventing / minimizing exposure of the consumer to any type of food hazard. Second tool is a quantitative measurement of health risks known as exposure assessment calculated as occurrence of a specified hazard in food interlinked with dietary habits of a specific target population.

When the WHO announced that Covid-19 is a public health emergency of international concern, food safety of all actors in the food supply chains has been put into focus and different tools have been introduced. Finally, the 17 Sustainable Development Goals adopted by the United Nations within its 2030 Agenda clearly emphasize that eight out of 17 SDGs correlated with food and food (safety) systems need to be addressed.

Keywords: Food safety; Improvement tools; Food supply chains; Food safety challenges

Teixeira-Lemos, E. (2022).
The Mediterranean Diet: A dietary pattern or a Medical Prescription?.

THE MEDITERRANEAN DIET: A DIETARY PATTERN OR A MEDICAL PRESCRIPTION?

Edite Teixeira-Lemos[1]
[1]CERNAS Research Centre; ESAV, Polytechnic Institute of Viseu, Portugal

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The famous aphorism ***'we are what we eat'***, frequently attributed to Hippocrates, remains current to this day. The relationship between nutrition and health has been studied extensively for more than half a century. The Mediterranean diet has been one of the most extensively studied dietary patterns, due to its wide-ranging health benefits. It is relatively difficult to pinpoint the beginnings of this diet. It seems to have originated in the food cultures of ancient civilizations which developed around the Mediterranean Basin. It should be noted that the Mediterranean diet is not, in fact, a single diet in the modern sense of the word "diet" and is rather a collection of eating habits, which might be better defined as a dietary pattern. Moreover, there is no single Mediterranean diet. The dietary practices of countries bordering the Mediterranean Sea vary considerably; even within the same country, significant differences in dietary patterns exist. Nevertheless, all of them are based on the regular consumption of plant foods (cereals, fruits, vegetables, legumes, tree nuts, and seeds), olive oil (as the main source of added fat), the moderate consumption of fish, seafood, and dairy, and low-to-moderate alcohol (mostly red wine) intake, with a limited use of meat products (particularly red meat).

In the early 1960s the Mediterranean diet drew the attention of medical professionals following the release of Keys et al. "Seven Countries Study". This study described strikingly low rates of coronary heart disease in the populations with a Mediterranean dietary pattern, when compared with other study populations. From then on, the Mediterranean diet began to receive increasing attention from medical scientific communities and several studies have been conducted to investigate whether this dietary approach could be associated with a reduced risk of mortality and morbidity in a general population. In populations with good adherence scores to Mediterranean diet, subsequent trials confirmed that, besides its beneficial effects in cardiovascular health, it also showed metabolic, cognitive, and anti-neoplastic benefits. The evidence of the benefits of the Mediterranean diet has obvious clinical and public health relevance. The findings support the appropriateness of the recommendations and guidelines produced by various major scientific and clinical organizations which encourage the adoption of a Mediterranean-style diet as an approach to the primary and secondary prevention of major chronic diseases.

Despite all its proven health benefits, the Mediterranean diet faces multiple challenges. The erosion of traditions and cultures in the Mediterranean populations by the unhealthy eating habits brought by worldwide acculturation threatens the survival of this dietary pattern. Furthermore, the Mediterranean diet must overcome barriers to increase its adoption in other regions of the world, where other less healthy eating habits still predominate, despite the wide recognition of its health benefits by the medical community.

The Mediterranean diet has therefore emerged from a series of dietary habits originated in a mixture of lifestyle, religion, and culture to an emerging tool in the promotion of health, particularly in a primary and secondary prevention setting. Further efforts are necessary in order to extend the benefits of the Mediterranean diet to the rest of the World.

Keywords: Chronic diseases; Dietary pattern; Healthy lifestyle; Human studies; Mediterranean diet; Public health nutrition; Sustainability

In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 11-11)

Keynote Communication

Bobiş, O. (2022).
Bee products as valuable source of nutrients and bioactive compounds. Normal of functional foods?.

In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 14-14)

BEE PRODUCTS AS VALUABLE SOURCE OF NUTRIENTS AND BIOACTIVE COMPOUNDS. NORMAL OF FUNCTIONAL FOODS?

Otilia Bobiş[1]

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Food products play a major role in human life. Is our choice to consume foos products that improve our health or on the contrary that may lead to certain health issues. Nowadays, the world is turning more and more to natural food products, and developing different processing methods in order to preserve the natural principles of ingredients. Proteins, lipids, sugars, water, vitamins and minerals are the basic requirements of a food product.

Bee products are healthy products made by the bees using as raw ingredients floral nectar and pollen, but also different resins found outside the hive, and/or own secretions, that have been used for centuries to promote health and wellness. The nutritive properties of bee products are known, investigated and used since long time. Honey is a source of simple sugars, bee pollen is a product rich in aminoacids and proteins as well as fatty acids and complex lipids, propolis on the other hand is a tremendous source of biologically active compounds with a major role in promoting health, by its high antioxidant and antibacterial properties. Royal jelly is called the “superfood” of the hive, because consumed alone is prolonging the queen bee’s life over 30 times compared to the worker bee life period. First just observing, after investigating, humans used these products for their nutritional properties, but later also for their beneficial role in preventing or treating different diseases. The use of honey internally for treating respiratory problems, or externally aleviating burns and infections is well known and nowadays the process of healing and the chemical pathways for curing are discovered. Propolis is the most important natural antibiotic, its benefic properties are demonstrated lately in the world crysis of Covid-19 pandemic.

Functional food sector is an important part of food marked, which lately have grown rapidly. The concept of “functional food” underlines the positive relation between nutrition and health. Bee products are perfect candidates either for normal foods (with their nutritional value), or for functional foods (because they contain a wide range of bioactive compounds with beneficial effects on human health).

Bee products possess many biochemical components which are found on many other functional foods. As stated before, proteins, sugars, fatty acids, amino acids and peptides, different pre or probiotics, minerals, enzymes, vitamins and organic acids are basic components of bee product’s chemical composition. Beside these, phenolic acids, flavonoids or carotenoids are also found in their compostion, making these foods magical and top superfoods, as they are sources for concentrated nutrition.

Concluding, authentic beehive products definitively may be clasified as “functional foods”, and consumed to improve health and strenghten the immune system.

Keywords: Food products; Functional foods; Bee products; Nutrients; Bioactive compounds

Pintado, M. (2022).
Antioxidant fiber: A key bioactive to valorise food plant by-products.

ANTIOXIDANT FIBER: A KEY BIOACTIVE TO VALORISE FOOD PLANT BY-PRODUCTS

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Dietary Fibre include all carbohydrate polymers with a degree of polymerization not lower than 3, which are neither digested nor absorbed in the small intestine. The concept of "Antioxidant Dietary Fibre" has been proposed by Saura-Calixto [1]. Dietary fibre contains significant amounts of natural antioxidants (mainly phenolic compounds) associated with non-digestible compounds [1]. It must contain a dietary fibre content higher than 50% (dry weight) and possess significant antioxidant activity that must be an intrinsic property, derived from natural constituents of the material. Besides the health benefits of IDF by itself, polyphenols are essential constituents of IDF with relevant properties. So, antioxidant Dietary Fibre possesses several advantages related to its antioxidant activity such as prevention of lipid and protein oxidation, improvement in quality and stability and free radical quenching capacity and several related health benefits. Most of plant byproducts such as vegetable, fruits and agro-industrial can have a great potential as a source of functional and bioactive compounds namely Antioxidant Dietary Fibre. The bound polyphenols contributed significantly to the antioxidant and prebiotics properties of dietary fiber and the bound polyphenols possess a very high resistance to gastrointestinal digestion, allowing a great protection compared to free polyphenols, highly susceptible to gastrointestinal conditions.

So, during this presentation besides the definition and relevance of antioxidant fiber several examples of byproducst as sources of antioxidant dietary fiber will be described (pineapple, olive pomace, avocato, melon, tomato, vegetables) including composition, gastrointestinal stability and some biological activities.

Keywords: Antioxidant dietary fibre; By-products; Vegetables; Fruits; Agroindustrial

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Oral Communication

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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 18-18)

EMOTIONAL RESPONSE TO DIFFERENT FOOD TASTE - NEW MODERATOR FOR DEPRESSIVE DISORDER DIAGNOSTIC

Elena Bartkiene[1], Vesta Steibliene[1], Virginija Adomaitiene[1], Dovile Klupsaite[1], Darius Cernauskas[2], Vita Lele[1], Laura Jarutiene[1], Grazina Juodeikiene[2]

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In general, food must meet basic nutritional and energy requirements [1, 2]. When consumers have a range of possibilities to choose from, many factors influence a variety of food choices [3]. It was reported that such factors as gender, age, education, psychological characteristics, eating habits, and food characteristics are significant for consumers deciding what to choose [3]. Regardless that many individuals are aware of some food products' unhealthy characteristics, it is hard to change their eating habits as they are dependent on food-induced positive emotions. From this point of view, food-induced emotions are the powerful determinants in choosing food [6]. In addition, food choice can also be related to our mood, which is a complex of positive and negative emotions and other factors. A human eating behavior (choice, quantity, and consumption frequency of particular food) is very strongly related to and depends on emotions [7, 8]. Moreover, a reduced or increased appetite and a loss of pleasure in eating are the factors related to a Major Depressive Disorder (MDD), which has been diagnosed for approximately 16% of the world's population [9]. Although MDD is a common disease that negatively affects the quality of life of many people worldwide, however, until now, there have been few studies on the emotional response to different food tastes for patients with MDD. The aim of this study was to evaluate the emotional response of patients suffering from MDD to the other characteristics of food tastes and compare the obtained results with a researched control group. The food tastes of 'sweet,' 'salty,' 'bitter,' 'sour,' and 'neutral' inducing the emotional responses in patients with and without MDD were analyzed and evaluated. The results showed that the patients with MDD expressed lower 'happy' and 'contempt' and higher 'surprised' emotions, along with a higher negative valence mean, compared with the control group for all the tested food tastes ($p \leq 0.05$). Finally, the study results can contribute to a better understanding and balancing of the diet for patients suffering from MDD. Furthermore, the development of new, more positive emotion-inducing food products can be very promising.

Keywords: Emotions; Major depressive disorder; Food tastes; Food–mood relation

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Barrera-Lopez, J., Vélez, L. F., Gonzalez, A., Hernández-Carrión, M. (2022).
Does the coffee quality and the preparation method affect the antioxidant content? A preliminary study.

DOES THE COFFEE QUALITY AND THE PREPARATION METHOD AFFECT THE ANTIOXIDANT CONTENT? A PRELIMINARY STUDY

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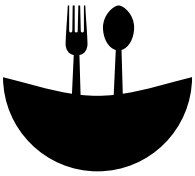
The diet of many countries includes coffee, a source of antioxidants. Moderate coffee consumption is associated with a low risk of chronic diseases and offers health benefits. There are many coffee brewing techniques available today, including manual preparations that are gaining popularity due to how easy consumers can brew themselves a good cup of coffee. Regarding its quality, the traditional coffee market is divided into two sectors: general consumption (commercial) coffees and specialty coffees. The aim of this research was to evaluate the effect of two preparation methods (namely, pot and V60), and the type of coffee (general or specialty) over the antioxidant capacity content.

For both the immersion (Amor Perfecto Pot) and filtration (Hario V60 ceramic dripper) methods, a ratio of 1:15 and a temperature of 90°C were used. Additionally, a medium grinding that consisted of mainly 0.43 mm particles was implemented. As for the immersion method, around 10 g of coffee was measured, then 150 g of water was poured in and left to infuse for 4 min. In the V60 method, two pre-infusions were done: one at a 1:2.5 ratio for 30 s, and another at a 1:8 ratio for 1 min. The ratio was then completed, and the infusion was performed after the filtration finished processing. Once the infusions were done, the Total Phenolic Content (TPC) and the Antioxidant Capacity (AC) were evaluated through the Folin-Ciocalteau and DPPH methods, respectively.

The factorial design 22 that was carried out showed that the type of coffee yielded significant differences, along with the interaction of said factor and the preparation method ($p<0.05$) for the TPC. The commercial coffee displayed a higher TPC than the specialty coffee, and the interaction revealed the V60 method extracted more phenols with the commercial coffee (38.32 ±0.64 µg GAE/g coffee) than the pot method (35.10 ± 7.47 µg GAE/g coffee). However, with the specialty coffee, the pot method extracted more phenols (Pot: 26.51 ± 1.08 µg GAE/g coffee) than the V60 method (V60: 22.63 ± 2.45 µg GAE/g coffee). As for the AC, only the main factors were significant to the antioxidant capacity ($p<0.05$). In relation to the preparation method, the pot method showed a higher AC (62.92 ± 9.55 µmol TE/10g coffee) compared to the V60 method (47.82± 15.02 µmol TE/10g coffee). Concerning the type of coffee, the specialty coffee presented a higher AC (65.67 ± 5.68 µmol TE/10g) compared to the commercial coffee (45.08 ± 12.93 µmol TE/10g coffee).

The results revealed that the effect of the preparation method on the TPC varied depending on the type of coffee used. In addition, the preparation method influenced the AC. This means that the immersion method (pot) could yield better results than the filtration method (V60). Moreover, while commercial coffee contains more phenols, specialty coffee has a higher AC. Therefore, the preparation method can be a tool used to optimize the bioactive compounds in the coffee infusion, and the specialty coffee gives both a better sensorial experience and the potential to offer a more functional beverage.

Keywords: Coffee; Brewing; Bioactive compounds; Preparation method



In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

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(pp. 19-19)

Orsini, S. F., Cortina, A. R., Carrión, M. H. (2022).
Effects of wall material ratio and oil concentration on the stability of embedding nanoemulsions in spray drying encapsulation.

In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 20-20)

EFFECTS OF WALL MATERIAL RATIO AND OIL CONCENTRATION ON THE STABILITY OF EMBEDDING NANOEMULSIONS IN SPRAY DRYING ENCAPSULATION

Santiago Federico Orsini[1], *Aureliano Rodríguez Cortina*[1], *María Hernández-Carrión*[1]

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Encapsulations processes ensure the stability of highly sensitive and labile bioactive compounds, such as polyunsaturated fatty acids (PUFAs), in different food systems. However, the effects of the emulsion preparation prior to the encapsulation of products, are often overlooked in spray drying encapsulation. This study presents the manufacturing by high-speed homogenization of nanoemulsions loaded with Sacha Inchi (***Plukenetia volúbilis L.***) oil using a DISPERMAT D-51580 (GETZ-MANN GMBH, Germany) at 18000 rpm for 10min. Various oil concentrations (5, 7.5% w/w) and ratios of maltodextrin: sodium caseinate (75:25, 80:20, w/w) were studied for particle size, pH, conductivity, flow behavior, surface tension, cremation index, and Turbiscan Stability Index (TSI). Emulsions with a 5% oil concentration and an 80:20 wall-material ratio exhibited higher stabilities and lower particle sizes. Subsequently, these high stability emulsions were spray-dried using a Mini Spray B-290 (BÜCHI, Switzerland) at 150 °C with its peristaltic pump set at 90% for an aspiration rate and a 10 % for pump rate. The powder was then characterized for encapsulation yield (EY), moisture content, bulk density, solubility rate, and thermal stability, obtaining values of 57.52%, 0.45%, 0.54 g/mL, 64.5 s/g, and 138 °C, respectively. Low humidity powders are more likely to present a lower water activity, which translates into less water available for biological reactions and therefore a lower microbial load. In addition, an encapsulation yield greater than 50% is deemed successful, protecting the PUFAs from oxidation; heat protection is also assured as shown by the thermogravimetric analysis, enhancing not only its shelf life but its capacity to withstand thermal food processing. In conclusion, spray drying encapsulation is a successful process to ensure Sacha Inchi oil stability, elongating the shelf life of the bioactive compounds and protecting them from food processing, increasing its potential applications in functional foods product development.

Keywords: Emulsion; Encapsulation; Spray Drying; Sacha Inchi oil; Bioactive compounds; Physicochemical stability

Martinho, V. (2022).
Food security: Spatial correlation analysis as a basis for policy implementation.

FOOD SECURITY: SPATIAL CORRELATION ANALYSIS AS A BASIS FOR POLICY IMPLEMENTATION

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Food security has been a concern of national and international organizations around the world, even more so today due to the challenges created by climate change. In fact, global warming has created and will increase pressure on the various public and private institutions to deal with difficulties related to water scarcity, reductions in available land for agricultural production and changes in the conditions for carrying out agricultural activities. At the same time, population growth brings additional uncertainties in the management of these frameworks.

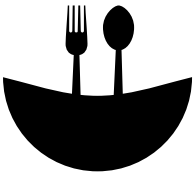
In this context, the main objective of this research is to identify spatial correlations for world food security that allow for the implementation of more adjusted policies by the competent organizations, taking advantage of the effects spread from strategic countries to their neighbors.

To achieve these intentions, statistical information from the FAOSTAT database for food security variables was considered. This information was evaluated by means of spatial autocorrelation analysis and following the procedures of the GeoDa software. In practice, spatial clusters were identified for positive and negative local autocorrelation.

The main findings highlight that there are relevant hot and cold pots worldwide that can be considered as a basis for strategic interventions in parts of the world to reduce food insecurity in less developed economies. In other words, high-high and low-low clusters and spatial lag and spatial error effects were found, showing that food insecurity is explained by the specific characteristics of each country, as well as by influences from neighboring nations. These are relevant insights that reveal that food insecurity requires joint strategies among neighboring countries.

In conclusion, the results presented here show that the contexts associated with food security are transversal to neighboring countries around the world, revealing that the solutions are national, but also international, appealing to common policies and programs, where transnational actions are decisive for the success and effectiveness of interventions.

Keywords: LISA cluster maps; Spreading effects; International organizations



In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 22-22)

SCHOOL LUNCH PROVISION ASSESSMENT DURING THE COVID-19 PANDEMIC

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With the onset of the COVID-19 pandemic, schools had to switch not only to distance learning but also to find solutions to provide pupils with state-funded school lunches. The school lunch aims to provide all pupils from the first to fourth grade with a healthy and warm meal that meets their nutritional and energy recommendations. To assess the real situation in Latvia, the aim of the study was to analyze: 1) different school approaches to providing lunch; 2) parents' assessment of the school lunch received; and 3) compliance of the school lunch composition with the healthy nutrition recommendations.
To achieve the aim of the study, a survey of pupils' parents was used, which was created in Google forms and sent to all Latvian schools. Participation in the survey was voluntary and anonymous. In the survey, parents were asked to indicate: 1) how the school provided free lunch to the pupils during a pandemic; 2) what was included, indicating products or groups of products; and 3) how parents rated it.

1495 parents, whose children study from 1st to 4th grade in various Latvian schools participated in the survey. The distribution of respondents by regions of Latvia was as follows: Riga (capital city) – 25.5%, Riga region – 20.0%, Vidzeme – 10.5%, Zemgale – 22.0%, Latgale – 15.0%, and Kurzeme – 7.0%, which allowed us to get a general insight into the situation in Latvia.
In 90.7% of cases, the school chose food packs as an opportunity to provide free lunches for pupils during the pandemic. The regional distribution regarding the provision of food packs was as follows: in Riga – 364 out of 381, in Riga region – 289 out of 295, in Vidzeme – 141 out of 157, in Zemgale – 284 out of 329, in Latgale – 194 out of 223, in Kurzeme – 84 out of 110. Some schools took a different approach to providing free lunch: 74 respondents indicated that they received support in the form of a gift card or voucher; 17 respondents wrote they received money in a bank account; 12 respondents received a free lunch in school for taking away; and 12 respondents stated that the free lunch was delivered at home.
1356 parents who received food packs gave their opinion on the support. 74.0% of respondents rated the school's chosen way of providing free lunch in the form of food packs – positively, 17.0%- partially positive, 6.0%- neutral, 2.0% – partially negative, and 1.0%- negatively. The most satisfied respondents were in Vidzeme (82.3%), followed by Kurzeme (77.4%) and Riga (76.1%), then Riga region (72.7%) and Zemgale (71.8%), the least satisfied respondents were in Latgale (68.0%).

The composition of food packs was described as follows by parents: 74.1% of respondents indicated that food packs contained both fruits and vegetables, in 31.6% of cases there was no bread, in 26.6% of cases – white bread, in 18.7% of cases – rye bread, in 99.7% of cases there were grain products like rice, buckwheat or pasta, in 84.7%- canned meat or meat products, in 82.9% of cases – milk, and 58.7% of cases – oil. 86.2% of respondents were satisfied with the food packs, indicating that it was additional support.

Assessing the compliance of the food packs' composition with the recommendations of a healthy diet and the nutritional and energy needs of pupils, it was concluded that in general the composition of the food packs intended for pupils' meals covered basic needs. Improvements were needed to unequivocally confirm that it was in line with the recommendations for a healthy diet.

Keywords: School lunch; Food packs; Pandemic; Pupils; Composition

This research was funded by the programm "Implemantation of fundamental research at Latvia University of Life Sciences and Technologies", project No G11.

EVALUATION OF ANTIOXIDANT ACTIVITY OF EXTRACTS OBTAINED FROM CHERRY SEEDS

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A disposal of considerable quantities of cherry fruit residues into the environment is occurring due to an increase in the rate of cherry production. Although cherry fruit is a rich source of polyphenols and bioactive compounds, there is little information on the presence of natural antioxidants in cherry pit. The main objective of this work was to find the best way to obtain valuable antioxidant products from cherry pits that can be later used in different applications in the food or pharmaceutical industries, among others.

The main focus of this work was to optimize the extraction conditions to obtain the best antioxidant activity from the extracts of cherry pit. For this, the cherry pits were dried, crushed and grounded to powder, that was then dried for 24 hours in an oven at 40 °C.

Extractions were performed at room temperature in an Erlenmeyer with magnetic stirring at medium speed for different solvents such as water, ethanol, methanol, and another extraction was performed with water using an ultrasonic bath. Water:ethanol mixture was chosen to test different treatment conditions, namely the solvent concentration (different water:ethanol ratios (v:v) were tested – 50:50; 60:40; 8:20 and 100:0) and extraction temperature (35 °C, 50 °C, 70°C and 80 °C), all stirred for 40 minutes. The antioxidant capacity was evaluated for the obtained extracts by using spectrophotometric methods: DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate), ABTS (2,2-azino-bis-(3-ethylbenz-thiazoline-6-sulfonic) and FRAP (ferric reducing/ antioxidant power).

Preliminary results for DPPH method showed that the antioxidant capacity was higher for the extraction with mixtures water:ethanol (0.72 mg TE/g), rather than with methanol or water stirred by ultrasounds with 0.26 mg TE/g and 0.33 mg TE/g, respectively. The most efficient solvent for the evaluation of antioxidant activity by ABTS was the water with magnetic stirrer (extracting approximately 1.3 mg TE/g), followed by methanol and water:ethanol (50:50), in both cases using magnetic stirring. The least interesting extraction procedure was with water using ultrasound stirring with a low value of 0.86 mg TE/g. These results indicated the most suitable conditions to use in the following experiments.

Core experiments for optimization of extraction conditions were done with variable solvent concentration and. The tests showed that the most efficient conditions for obtaining the highest antioxidant activity by DPPH were 70 °C and water:ethanol solution 50:50, (0.74 mg TE/g). The highest antioxidant activity using the ABTS method was recorded at 70 °C with a 60:40 ethanolic solution. In the FRAP method, the best result with a value of 3.46 mg TE/g was obtained at 35 °C with the 50:50 solution. Each one of these methods demonstrated that 100% H2O leads to a significant reduction in antioxidant activity in cherry pit extracts.

The main conclusion of this work is that overall water:ethanol mixtures were the best solvents. Furthermore, considerable values were achieved with 50:50 60:40 and 80:20 ratios but the best results were generally obtained with the 50:50 ratio. The best temperatures for the extraction depended on the method used to determine the antioxidant activity but, in most cases, a higher temperature favored the extraction of compounds with antioxidant activity. Thus, we can conclude that cherry pit can be used as a raw material for the extraction of compounds with a fairly good antioxidant activity that might be applied in health, food and pharmaceutical industries.

Keywords: Cherry seed; Cherry pit; Extraction; Temperature; Extracting solution

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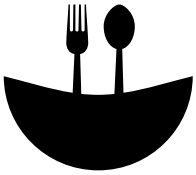
(pp. 23-23)

Starkute, V., Zokaityte, E., Mockus, E., Klupsaite, D., Lukseviciute, J., Bogomolova, A., Streimikyte, A., Bartkiene, E. (2022).

The changes of Boletus edulis, Cantharellus, and Rozites caperata edible mushrooms characteristics during the fermentation.



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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 24-24)

THE CHANGES OF BOLETUS EDULIS, CANTHARELLUS, AND ROZITES CAPERATA EDIBLE MUSHROOMS CHARACTERISTICS DURING THE FERMENTATION

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The aim of this study was to apply fermentation on edible mushrooms (*Suillus luteus* (SL), *Boletus edulis* (BE), *Cantharellus* (Ca), and *Rozites caperata* (RC))with antimicrobial properties, in the presence of lactic acid bacteria (LAB) strains (*L. uvarum* LUHS245 and *L. casei* LUHS210), and to evaluate the influence of the used technology on the colour characteristics, pH, sensory properties, volatile compounds (VC) profile and biogenic amines (BAs) formation. In addition, ultrasonication pre-treatment before fermentation, was tested and emotions induced for consumers by treated mushrooms were evaluated. Better preservation properties in the case of fungi inhibition showed the LUHS245 strain, however, thermally treatment and (or) ultrasonication, before fermentation, ensured safer fermentation. Multivariate analysis of variance showed that mushroom species, thermal treatment and (or) ultrasonication, as well as interaction of these factors was significant on the samples colour coordinates and pH ($p \leq 0.0001$). In comparison thermally treated and ultrasonicated mushrooms, with fresh samples, in all the cases, lower mold and yeast count in treated samples was established, as well as between samples pH and mold and yeast count significant positive moderate correlation was found ($r= 0.6430$, $p = 0.0001$). The main VC in all the tested fresh mushrooms was 1-octen-3-ol, other main VC were: 3-octanol and 1-octanol – in BE, oct-(2E)-enal and (E)-2-octen-1-ol – in Ca, and benzaldehyde – in RC. As well as higher variety of VC in treated mushrooms VC profile were identified, and the highest variety was shown in pre-treated and fermented samples, with predominant VC the 1-octen-3-ol. Despite that significant differences between the mushrooms overall acceptability were not found, significant differences between the emotions induced for consumers were established, and the highest emotion 'happy' by testing BE ultrasonicated and fermented samples was expressed. Significant correlations between emotion 'happy' and some of the mushroom VC were found. However, ultrasonication before fermentation, in comparison with thermal treatment before fermentation, increases sum of BA in BE and RC (on average, by 15.3 and 2.4 times, respectively). On the contrary, ultrasonication before fermentation reduces sum of BA in Ca (on average, by 2.4 times). Finally, it could be stated that despite good overall acceptability, further studies are needed to select appropriate LAB strains for edible mushrooms fermentation, to ensure their safety in case of BA formation.

Keywords: Edible mushrooms; Fermentation; Lactic acid bacteria; Volatile compounds; Biogenic amines; Emotions

Kam, N., Rimba, C., Beatrix, S. (2022).
Utilization of amazake powder made from lesser yam (Dioscorea esculenta lour. burkill) and rice (Oryza sativa L.) as sugar substitute in bread.

UTILIZATION OF AMAZAKE POWDER MADE FROM LESSER YAM (DIOSCOREA ESCULENTA LOUR. BURKILL) AND RICE (ORYZA SATIVA L.) AS SUGAR SUBSTITUTE IN BREAD

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Amazake is a fermentation product made from *Koji mold* (*Aspergillus oryzae*). It has varied derrivatives and has become the foundation of many food condiment originated from East Asia Region. During fermentation, the mold (*Aspergillus oryzae*) will turn starch into simple sugar, and also produce a lot of vitamins and mineral adding a nutritious benefits to the end products. The fermentation done by this koji will enhance sugar content through saccharification process producing a sweetened product called amazake. Amazake has been known to contain many functional benefits such as blood pressure-lowering effects, antiobesity effects, liver-protecting effects, and antiamnesic effects. In this research lesser yam, a native sweet cassava tuber from indonesia was used along side rice as a substrate for koji fementation. Lesser yam or known as ubi gembili, has been known to contain high amount of carbohydrate and also rich in many bioactive compounds such as water-soluble polysaccharides, dioscorin (lower blood pressure and trypsin inhibitor), and diosgenin (control cholestrerol metabolism). Despite its many health benefit the use of gembili in food product was still limited.

Lesser yam and rice were made into amazake powder through solid state fermentation using koji mold Aspergillus oryzae with different fermentation times (0 (control), 24, 48, 72, and 96 hours). After fermentation, the koji fermented rice or lesser yam were diluted with water and heated at constant-temperature bath at 55 °C for 6 h to further increase the saccharification process, the resulting products will be dried and further called as amazake powder. The best fermentation time was decided based on the evaluation of the amylose and sugar content of the amazake powder. The amazake powder with the biggest sugar content will be used as the sugar substitute for bread making. The Amazake powder made from rice and lesser yam were compared in terms of their sugar content, amylose content, chemical composition and physical appearance. The amazake powder fermented for 72 h showed the highest degree of saccharification (higher sugar content) and also contained a substatial amount of protein (5-13%) and fat (1-2%).

In the bread making process, sugar is needed not just as a flavor but also contribute to the structure of the bread. Sugar aids in yeast fermentation, producing gas and aromatic compound that will build up the desired structure and distinct aroma of the bread. Sugar also helps with the crust color formation, through the maillard and caramellization. By replacing sugar with the amazake powder that also contain substantial amount of sugar but with higher functional benefit, it was hope that the bread produce will retained their physicochemical characteristic and sensory characteristic but also have additional functional benefit.

In this research bread were made with 4 different treatment; with normal bread as control, no sugar bread and bread made with amazake powder (lesser yam and rice amazake powder). The bread made with both lesser yam and rice amazake produce a similar acceptance level in terms of sensory evaluation (similar level of acceptance in crust and crumb color, sweetnees, texture and overall acceptance) with traditional bread made with sugar albeit denser structure (lower volume expansion and firmer texture) compare to bread made with sugar. This showed the potential used of amazake powder from both lesser yam and rice as sugar replacer in bread making.

Keywords: Amazake; Koji mold; Lesser Yam; Bread

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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 26-26)

INDULGENT OR INFORMATIVE LOGOS? EFFECT ON UNIVERSITY STUDENTS' INTENTION TO PURCHASE HEALTHY AND SUSTAINABLE FOOD

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Identifying strategies to steer consumers' eating habits towards healthier and more sustainable eating choices is crucial as today's dietary decisions have an impact on both consumers' health and the planet, including climate change.

University students are the target group of this research as they are in a critical phase of their lives that could contribute to altered dietary habits. Furthermore, eating behaviors of young adults would play an important role to shape the population's future diet. Considering the current increased use of online platforms for food purchasing – especially after the COVID-19 pandemic – investigating approaches that could be effective in the online environment is critical. Thus, this research aims at investigating the effects of logos to encourage university students to select healthy and sustainable (H&S) dishes.

The research includes an explorative phase and an experimental study. First, four focus group discussions (explorative phase) were conducted in December 2021 with university students (n= 24) from the University of Parma, Italy, to investigate attitudes and opinions on health and sustainability, food purchasing apps, and university canteens. Several projective techniques were used to facilitate the discussion and to further analyze students' views on relevant topics. Specifically, techniques were developed to investigate students' preferences towards logos to be used to identify healthy and sustainable dishes on a pre-ordering app of the university canteen.

The data collected during the focus group discussions were analyzed with qualitative content and thematic analysis. The results identified elements, stimuli, and concepts that matter to university students when dealing with health and sustainability.

Results of the explorative phase were used as input for the last part of the study, an experimental survey. A between-group design approach was used to test the effect of indulgent ("Chef choice") and informative ("Healthy and Sustainable") logos to encourage university students from the University of Parma to select H&S dishes, and to understand whether different types of logos could affect students with different goal orientations.

The data collection phase has been conducted during spring 2022 and preliminary results will be available at the time of the Food Choice & Eating Motivation Conference.

Results will provide information on the effectiveness of logos as a tool to steer university students' food choices. Finally, possible strategies and implications will be discussed.

Keywords: Food choices; Eating motivations; Nutrition; Intervention

Ferrão, A. C., Guiné, R., Rodrigues, C., Martins, H., Correia, P. (2022).
Textural properties of some Portuguese hazelnut.

TEXTURAL PROPERTIES OF SOME PORTUGUESE HAZELNUT

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Hazelnut characteristics vary according to different aspects, such as the variety, harvest year and geographical location of the orchard. Texture is undeniably one of the most important physical characteristics of foods, affecting consumers' choices. Therefore, the aim of this study was to compare the textural properties of some hazelnut varieties cultivated in Portugal, namely Grada de Viseu, Tonda de Giffoni, Negreta, Segorbe, Longa de Espanha, Butler and Gunslebert, as well as to compare the textural properties of the variety Grada de Viseu, the most representative variety in Portugal, through different harvesting years (2017, 2018, 2019) and location of production (Viseu or Faia). For that purpose, 30 fruits from each sample, were submitted to two independent tests, namely shell crushing and core cutting in order to calculate hardness and friability.

The results showed that the hardness of the shell was higher for the variety Grada, followed by the variety Negreta, Tonda, Gunslebert, Segorbe, Butler and finally the variety Longa. As for the hardness of the core, the variety with the highest value was Gunslebert, followed by Grada, Negreta, Tonda, Longa, Butler and Segorbe. Regarding the friability of the core, varieties Segorbe, Longa and Butler exhibited the highest values, meaning that they were less susceptible to fracture, while the variety Tonda presented the lowest value. Considering the results according to harvest year and location of production, it was possible to observe that Grada cultivated in Viseu and harvested in 2018 was the sample with the harder shell, while the sample harvested in 2019 and cultivated in Faia had a harder core. As regards friability of the core, Grada cultivated in Faia in 2018 presented the lowest value, while the sample Grada cultivated in Viseu in 2018 was less susceptible to fracture. Furthermore, were found significant differences among the samples from Viseu, regarding the hardness of the shell and the friability of the core, according to the year of harvest. As for the location of production, there were statistically significant differences between the samples of 2018 from Viseu and Faia, regarding the hardness of the shell and the friability of the core.

These results are important for all stakeholders in the hazelnut sector.

Keywords: Hazelnut; Varieties; Textural properties; Harvest year; Geographical location

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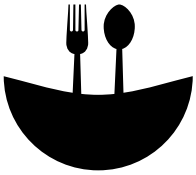
Henriques, C., Matos, A., Malva, M., Bartkiene, E., Djekić, I., Tarcea, M., Sarić, M. M., Černelič-Bizjak, M., Dolar, V., EL-Kenawy, A., Ferreira, V., Klava, D., Korzeniowska, M., Vittadini, E., Leal, M., Frez-Muñoz, L., Papageorgiou, M., Szűcs, V., Correia, P., Guiné, R. (2022).

Food choice as influence by marketing motivations: Cross country study involving 16 countries.



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ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

(pp. 28-28)

FOOD CHOICE AS INFLUENCE BY MARKETING MOTIVATIONS: CROSS COUNTRY STUDY INVOLVING 16 COUNTRIES

Carla Henriques[1], Ana Matos[1], Madalena Malva[1], Elena Bartkiene[2], Ilija Djekić[3], Monica Tarcea[4], Marijana M. Sarić[5], Maša Černelič-Bizjak[6], Veronika Dolar[7], Ayman EL-Kenawy[8], Vanessa Ferreira[9,1], Dace Klava[10], Małgorzata Korzeniowska[11], Elena Vittadini[12], Marcela Leal[13], Lucia Frez-Muñoz[14], Maria Papageorgiou[15], Viktória Szűcs[16], Paula Correia[1] and Raquel Guiné[1]

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Presenting author: Carla Henriques

Commercial and marketing motivations underlie many of the people's choices regarding food. Indeed, advertising and marketing strategies are designed to capture consumer interest and lead them to make certain choices. This influence reaches all ages, with the youngest being particularly vulnerable (Calvert, 2021). What other segments of society are more subject to this influence? This study addressed this question, outlining some characteristics of consumers who are more prone to commercial and marketing motivations. Data were collected within the scope of the EATMOT project and include responses from 11,919 consumers to a questionnaire described in Ferrão et al. (2019). Sixteen countries are represented in this sample and seven items were used to measure commercial and marketing motivations. An exploratory factor analysis by country was performed and three items were consistently combined in one factor for all countries. The other items were studied individually. Based on these motivational variables, a cluster analysis was conducted, applying different cluster procedures and analysing the stability and interpretability of cluster solutions. Two clusters emerged, differentiated by the level of commercial and marketing motivations, namely, the Notably Motivated Consumers and the Low Motivated Consumers. These two clusters were then compared using statistical tests and logistic regression analysis. Consumers of the Notably Motivated cluster were significantly younger (32.7 vs 36.7 years old, $p<0.005$), as expected, and this cluster also had a higher percentage of women (72.2% vs. 70.2%, $p=0.016$), a higher percentage of single individuals (51.9% vs. 37.9%, $p<0.005$), a lower proportion of individuals with university education (58.3% vs. 66.1%, $p<0.005$), more consumers living in rural or suburban areas (37.2% vs. 27.6%, $p<0.005$), and more consumers without an active professional activity, that is, unemployed, non-working students or retired (43.1% vs. 31.1%, $p<0.005$). Furthermore, higher BMI and less physical exercise revealed to be associated with a greater chance of belonging to the notably motivated group ($p<0.005$). This study also reveals that shellfish or gluten intolerance, high cholesterol or hypertension are associated with less propensity to be in the segment of the notably motivated consumers, but, on the contrary, gastric disorders seem to confer more propensity to be in this segment. We thus obtained evidence that the propensity for higher levels of commercial and marketing motivations is associated with sociodemographic, anthropometric, behavioural and health related characteristics of the consumer.

Keywords: Marketing segmentation; Food consumption; Eating motivation; Cluster analysis

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PORTUGUESE PURCHASE AND CONSUMPTION HABITS TOWARDS CHILLED MEAT AND DAIRY READY-TO-EAT FOOD

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The modern lifestyle of metropolitan populations, characterized by a hectic life with no free time, family structure changes, or simply due comfort or convenience, has changed people's eating habits. To meet people's needs, the food industry is constantly developing a great variety of food products. This lifestyle led to a significant increase in demand of a great variety of Ready-To-Eat (RTE) food products, including: salads, fresh fruits and vegetables, fruit, pre-cooked meals, smoked meat or fish, or chilled meat and dairy. The consumption of RTE food products has rapidly increased in all western countries, including Portugal.

The present study intends to characterize the Portuguese consumer's attitudes towards chilled meat and dairy RTE foods. The study was based on a questionnaire survey disclosed through an internet platform. The sample consisted of 350 individuals, who voluntarily answered the questionnaire. The survey included questions to characterize the Portuguese purchase and food safety attitudes pattern of dairy and meat RTE food products. Also questions to characterize the sociodemographic population involved were included.

Related to the format of the RTE meat and dairy products that is disclosed to the consumer, the results indicate that it is not clear to the participant which is the safer format, pre-packed or cut-to-order. The respondent's opinion is that chilled RTE dairy and meat food products are safer if purchased at the delicatessen department in the supermarket than those purchased at the open market/bazaar. Based on the customer's habits, the results also confirm that participants usually purchase RTE dairy or meat food products mostly in the supermarket, and in pre-packed format.

Concerning the attitudes or practices towards food safety of chilled dairy and meat RTE products, some points can be highlighted: a large majority of consumers have a good food safety attitude towards the maintenance of the refrigerated food cold chain, keeping the RTE dairy and meat products in the refrigerator; most of the participants admit storing the RTE meat and dairy food products on separate shelves from fresh fruits/ vegetables in the refrigerator.

Keywords: Portuguese consumer's habits; Ready-to-eat food; Food safety; Chilled products; Dairy; Meat

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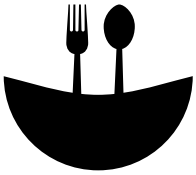
Zavistanaviciute, P., Zokaityte, E., Starkute, V., Ruzauskas, M., Viskelis, P., Bartkiene, E. (2022).
Berry by-products in combination with antimicrobial lactic acid bacteria strains for chewing candies formulation in sustainable manner.



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BERRY BY-PRODUCTS IN COMBINATION WITH ANTIMICROBIAL LACTIC ACID BACTERIA STRAINS FOR CHEWING CANDIES FORMULATION IN SUSTAINABLE MANNER

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The aim of this study was to develop formulations of chewing candies (CC) in a sustainable manner by using berry by-products in combination with antimicrobial lactic acid bacteria (LAB) strains. To implement the aim, the optimal quantities of by-products from the lyophilised raspberry (Rasp) and blackcurrant (Bcur) juice production industry were selected. Prior to use, L*actobacillus plantarum* LUHS135, *L. uvarum* LUHS245, *L. paracasei* LUHS244, and *Pediococcus acidilactici* LUHS29 strains were multiplied in a dairy industry by-product – milk permeate (MP). The antimicrobial activity of the selected ingredients (berry by-products and LAB) was evaluated. In addition, two texture-forming agents for CC formulations were tested: gelatin and agar. Also, sugar was replaced with xylitol. The most appropriate formulation of the developed CC according to product texture, colour, total phenolic compound (TPC) content, antioxidant activity, viable LAB count during storage, overall acceptability (OA), and emotions (EMs) induced for consumers was selected. It was established that the tested LAB inhibited 3 pathogens out of the 11 tested, and blackcurrant by-products inhibited all 11 tested pathogens. The highest OA was shown for the CC prepared with gelatin and 5 g of Rasp and Bcur by-products. The Rasp and LUHS135 formulation showed the highest TPC content (147.16 mg 100 g−1 d.m.), antioxidant activity (88.2%), and LAB count after 24 days of storage (6.79 log10 CFU g−1). Finally, it can be stated that gelatin, Rasp and Bcur by-products, and L. plantarum LUHS135 multiplied in an MP are promising ingredients for preparing CC in a sustainable manner, and the best CC formula consisted of gelatin + Rasp by-products + LUHS135 which, in addition showed the highest OA (score 9.52) and induced the highest intensity of the EM ‘happy’ (0.231).

Keywords: Chewing candies; Berry by-products; Lactic acid bacteria; Milk permeate; Overall acceptability; Emotions induced for consumers; Antioxidant activity

Trollman, H., Jagtap, S., Trollman, F. (2022).
Crowdsourcing food security: introducing food choice derivatives for sustainability.

CROWDSOURCING FOOD SECURITY: INTRODUCING FOOD CHOICE DERIVATIVES FOR SUSTAINABILITY

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Humanitarian crises highlight the willingness of people to come to the aid of others. Yet few are capable of impactful individual action. Intermediaries such as NGOs and charities may lack resources on a larger scale, and governments may be slow or unable to intervene effectively. Moreover, the existing market in commodities drives profit-taking with little empathy for human suffering. This work proposes a mechanism to bring aggregated acts of consumer compassion and sustainability to commodities markets to mitigate food security shocks.

Global food supply chains are unprepared for the increasing number and severity of the expected environmental, social and economic shocks in the coming years. Covid-19 led to a demand-induced shock driven mainly by consumer behaviour. The war in Ukraine is creating a food supply shock which may be exacerbated or followed by climate-related shocks. The price-setting process of commodities is directly impacted by such shocks, influencing consumer behaviour regarding food choice and consumption. Both the market and advances in precision agriculture drive increased production and consumption. The objective of this research was to design a futures derivative that harnesses consumer behaviour to mitigate such shocks through decreased consumption and reduced waste.

The SAPPhIRE model of causality was applied to understand how sustainble and ecologically embedded futures derivatives could have a role in affecting commodity markets. Multi-agent systems were combined with artificial intelligence and edge computing to provide the necessary functionality. Wheat production in the United Kingdom (UK) in the context of the impact of war in Ukraine was used as a case study to inform the design of consumer “food choice” derivatives.

Results show that, supported by enabling technology, sustainable consumer behaviour may be aggregated for ecological embeddedness (benefiting all parties, including the natural environment). As there is a time delay between a shock to agricultural production and the planned delivery of food products, there exits opportunity for redistribution or reallocation and price mitigation. The case study considers bread, one of the most wasted foods in the UK, to illustrate that sufficient quantities of consumer waste exist to be traded on wheat futures exchanges.

In conclusion, anticipatory action by consumers may prevent price rises and contribute to the delivery of wheat to North African countries originally intended to be supplied with Ukrainian wheat. The proposed derivatives could support the change in consumer behaviour. When implementing food choice derivatives, care must be taken to ensure that consumer food choices are rational and compatible with individual nutritional needs and financial situations, and that the legitimate interests of agrifood businesses are protected.

Keywords: Crowdsource; Derivatives market; Food security; Food waste; Sustainability

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(pp. 32-32)

BIGELS AS FAT SUBSTITUTES AND DELIVERY SYSTEMS FOR BIOACTIVE COMPOUNDS IN PORK PATTIES

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The term bigel (hybrid gel), is used to describe a biphasic system that is formed from two gels, one water-based and one oil-based. These systems present some advantages over conventional gels, such as, emulsions, oleogels and hydrogels. They are characterized as physiochemically and thermodynamically more stable. Pharmaceutical and cosmetical industries have been using bigels as delivery systems for bioactive compounds; however, the applications of bigels in the food industry is limited. Bigels could be utilized as fat substitutes and/or bioactive compounds delivery systems in food products, to increase nutritional value and decrease the energy and saturated fat content of such products.

The aim of this study was to incorporate olive oil bigels in pork patties, to reduce the animal fat and use the bigels as delivery systems for oregano essential oil (OEO). The bigels were produced using a hydrogel structured with 10% gelatin and an olive oil oleogel structured with 15% monoglycerides. The OEO was incorporated into the oleogel phase of the bigel. Two types of bigels were produced in oleogel to hydrogel ratios of 40/60 and 60/40. Pork patties were formulated with either 20% pork fat (control) or 10% pork fat and 10% bigel. Cooking loss (%) and lipid oxidation (TBA test) were measured on the cooked patties.

The 40/60 bigel, due to the higher content of gelatin hydrogel, had a harder and more elastic texture. On the other hand, the 60/40 bigel had a consistency similar to animal fat and it was easier to incorporate into the patties. There were no significant differences in cooking losses between the control and the patties formulated with 40/60 bigels as all three samples presented an average loss of 20.2% (control 20.34%, plain bigel 20.16% and 20,27% OEO bigel). The cooking losses on the patties with 60/40 bigels had an average value of 20.8% (21.11% control, 20.85% plain bigel and 20.59% OEO bigel). Patties formulated with plain 40/60 bigels did not show significant differences in lipid oxidation levels compared to control (5.60 vs. 4.74 mg MDA/kg, respectively) after 7 days of storage at 4 ^{o}C. However, when OEO was added to the bigels, a significant decrease in lipid oxidation was observed (1.27 mg MDA/kg). Similar results were observed for the patties formulated with 60/40 bigels. The TBA values of the control, plain bigel and OEO bigel patties were 4.10, 2.93 and 0.89 (mg MDA/kg), respectively.

In conclusion, two different types of bigels were successfully used as fat substitutes improving the nutritional profile of the patties without affecting cooking yield. Additionally, the bigels were efficient delivery systems for oregano essential oil in pork patties helping control lipid oxidation.

Keywords: Bigels; Fat substitutes; Bioactive compounds; Delivery systems; Pork patties

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Yanti, R., David, W., Ardiansyah (2022).
The consumer motivation on online purchasing organic food.

THE CONSUMER MOTIVATION ON ONLINE PURCHASING ORGANIC FOOD

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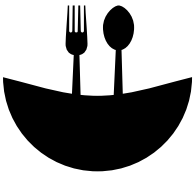
Organic food relies on consumer trust as the driver of its buying process. In normal condition, it is mostly purchased directly (offline) by consumers to ensure its organic authenticity. The increasing of organic food during Covid 19 consumer prefer to buy organic food online. The purposes of these studies were to determine the driving factors of purchasing organic food by online retailing, the types of organic food were purchased, and the relationship between consumer motivation and online purchasing decisions. This study uses cross-sectional method, with purposive sampling technique and the data processed using SPSS with General Linear Model analysis. The results from 102 respondents in Indonesia showed that convenience, practical, and time efficiency as the biggest motivation of consumers (85.30%). On the other hand, the pleasure as the smallest consumer motivation (1.0%). Vegetables and processed seeds/nuts products widely purchased as fresh and processed organic foods. There was a positive relationship between consumer motivation and online purchasing decisions. The consumer motivation driving factors are diverse product variants, attractive packaging, organic labels, nutritional value, discounts, time efficiency in purchasing, easy-to-find online stores, and advertising. Affordable prices are not a significant factor for consumers to decided organic food purchases by online. Therefore, consumers prefer to purchase online because its convenience.

Keywords: Consumer motivation; Consumer behaviour; Online retailing; Organic food



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(pp. 34-34)

ALTERNATIVE TECHNOLOGY FOR WHEAT BRAN-BASED SOURDOUGH PREPARATION AND BREAD ENRICHMENT

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Wheat (*Triticum spp.*) is one of the most popular cereal varieties in the world because of its exceptional technological properties, which are specifically suitable for bread preparation. Endosperm is the most popular part of the wheat grain, used for bread making, as it includes proteins (especially desirable gluten proteins: gliadin and glutenin), which leads to the high porosity of bread. However, despite most of the functional compounds of the wheat grain being found in the outermost tissues, these layers of wheat grain have not, until now, been used efficiently enough. Previous studies showed that valorized wheat bran can be used for many purposes, including wheat bread enrichment. Even though non-processed wheat bran is complicated to apply for the enrichment of bread because of its specific technological characteristics. The aim of this study was to estimate the influence of extruded and fermented wheat bran on the value of wheat bread, including the volatile compounds (VC) profile and VC relationship with emotions caused for consumers. A comparison study of wheat bread (prepared with 5%, 10%, and 15% untreated wheat bran (nWB) and fermented wheat bran (fWB)) quality parameters was presented. It was established that nWB increases dough hardness and reduces the specific volume of bread. The addition of 5% and 10% of fWB was not significant on wheat bread porosity and led to the formation of a high number of large pores. nWB and fWB increase the mass loss of wheat bread after baking (by 13.38%), and the control bread showed the highest crust darkness, yellowness, and redness. nWB and fWB reduce wheat bread firmness during storage, and fWB increases the overall acceptability (OA) of wheat bread (by 26.2%). A strong positive correlation was found between OA and the emotion 'happy' (r = 0.8696). In wheat bread prepared with fWB, a higher content of pyrazine, methyl-; pyrazine, 2-ethyl-; pyrazine, 2-ethyl-6-methyl-; furfural; ethanone, 1-(2-furanyl)-; benzaldehyde; and 3-furanmethanol was found. Finally, it can be concluded that valorized wheat bran can extend the shelf life of wheat bread and develop the formation of a specific VC profile related to a higher OA of the product.

Keywords: Extrusion; Wheat bran; Fermentation; Wheat bread; Volatile compounds

Fernandes, F. A., Heleno, S. A., Carocho, M., Calhelha, R. C., Pires, T. C. S. P., Freitas, J. C., Prieto, M. A., Ferreira, I. C. F. R., Barros, L. (2022).

Fruit of *Adansonia digitata* L. (mukua): A promising source of molecules for nutraceutical application.

FRUIT OF *ADANSONIA DIGITATA* L. (MUKUA): A PROMISING SOURCE OF MOLECULES FOR NUTRACEUTICAL APPLICATION

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The use of plants for medicinal purposes goes back to ancient times. *Adansonia digitata* L. is a tree native to the African continent with many traditional uses, including medicinal and food. The fruit of this tree is commonly known as mukua, and consists of pulp, fibrous tissue, and seeds. The pulp has been approved as a food ingredient by the European Commission and the Food and Drug Administration. Consumers are increasingly aware of what they consume, combining food and health, being their preference characterized for more natural products with health benefits. Therefore, nutraceutical products have received more attention from the consumer, being highly acceptable, and the first choice for exigent consumers.

Thus, the objective of this work is to exploit the nutraceutical potential of mukua pulp, through its nutritional, chemical and bioactive characterization.

The nutritional profile analysis, including proteins, crude fat, moisture, ash, carbohydrates, and energy were performed following the AOAC official methods. Free sugars were identified by an HPLC-RI system, organic acids by UFLC-PDA and fatty acids by GC-FID. For the determination of the bioactive potential, the antioxidant activity was verified through the cellular antioxidant assay (CAA) and the inhibition of thiobarbituric acid reactive substances (TBARS). Its antimicrobial potential against food borne bacteria, fungi and clinical bacteria was analysed through the microdilution method. Furthermore, cytotoxicity was analyzed in three tumor cell lines (gastric adenocarcinoma (AGS), breast carcinoma (MCF-7) and non-small cell lung carcinoma (NCI-H460)) and a non-tumoral cell line (non-tumour culture from African green monkey (VERO)) through the Sulphorhodamine B method.

Regarding the results, mukua pulp had a very low moisture content (11.9 + 0.3 g/100 g dw). The macronutrients present in greater amounts were carbohydrates (89.6 ± 0.2 g /100 g dw), followed by proteins (2.7 ± 0.3 g/100 g dw) and by crud fat (1.8 + 0.1 g/100 g dw), representing an energy value of 386 ± 1 kcal. Three sugars (fructose, glucose, and sucrose) and three organic acids were quantified (oxalic, citric, and succinic), being fructose (2.3 ± 0.2 g/100 g dw) and citric acid (8.73 ± 0.03 g/100 g dw) the most abundant ones, respectively. Regarding fatty acids, twelve compounds were quantified with greater abundance of oleic (C18:1n9c – 81%) and palmitic (C16:0 – 10%) acids. Concerning the antioxidant activity, the pulp inhibited about 32% of cell oxidation in the CAA method and exhibiting an EC50 value (concentration providing 50% of antioxidant potential) of 23.0 ± 0.1 µg/mL for TBARS assay. For antimicrobial activity, the pulp presented bacteriostatic activity against most of the food bacteria, with stronger inhibition against Yersinia enterocolitica (minimum inhibitory concentration (MIC) = 0.3 mg/mL), and against the clinical bacteria Enterococcus faecalis (MIC- 0.6 mg/mL). Finally, in the cytotoxicity assay, the pulp demonstrates the ability to inhibit cell proliferation against the tested tumor cell lines, especially against AGS with GI50 values of 92 ± 1 µg/mL, with no toxicity for the normal cells.

This study shows that the mukua pulp, in addition to being nutritionally interesting, has a high content of citric acid (scientifically proven preservative power) and high content of oleic acid (multiple pharmacological effects). Furthermore, we proved that the pulp of this fruit, which is so consumed on the African continent, has a high bioactive potential, proving to be a promising candidate to the development of a nutraceutical formulation.

Keywords: *Adansonia digitata* L.; fruit pulp; Bioactive activities; Nutraceuticals

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(pp. 36-36)

APPLICATION OF NEAR-INFRARED SPECTROSCOPY TO CHARACTERIZE VOLATILE PHENOLS AND SENSORY PROFILE OF AGED WINE SPIRITS

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Volatile phenols are low molecular weight aromatic alcohols, with particular importance in wine spirits aged with wood due to their strong influence on sensory profile. Some of them are responsible for characteristic odor notes of several foods and beverages in wine spirits aged with wood. Currently, the analytical determination of these compounds is mostly carried by time-demanding chromatographic methods. Thus, their identification and/or quantification, especially by a fast, simple and accurate methodology, is of great interest for quality control.

In this study, spectral data acquired by Near-infrared spectroscopic (NIR) technique was used to predict the content of these compounds, in particularly eugenol, guaiacol, 4-methyl-guaiacol, syringol, 4-methyl-syringol and 4-allyl-syringol in samples of aged wine spirits. In addition, the volatile phenols' concentrations were determined by GC-FID (after liquid-liquid extraction) using the same sample set.

The wine spirits were obtained within the Oxyrebrand project (https://projects.iniav.pt/oxyrebrand, shows a detailed explanation about the experimental design). Briefly, the samples were aged with chestnut or oak wood species, in 250 L wooden barrel and by an alternative technology using 50 L glass demijohns with wood staves and different levels of micro-oxygenation (MOX) in a total of 112 samples.

For the volatile phenols analysis, partial least square regression (PLS-R) models were developed with NIR spectra in the near-IR region of 12500 to 4000 cm-1. In the PLS-R developed method, cross-validation with 50% of the samples was made along with a validation test set with 50% of the remaining samples. Principal component analyses (PCA), using the results obtained with a trained sensory panel and those of IR-Spectra, were made to compare the analytical and the sensory characteristics of the studied wine spirits.

PLS-R models showed good accuracy; R2 ranged from 0.9732 to 0.9579 for syringol (2-Hydroxy-1,3-dimethoxybenzene) and 4-methylsyringol (2,6-Dimethoxy-4-methylphenol), respectively, with an RPM ranging between 6.11 to 4.88 for the same compounds. Concerning the sensory data, the PCA obtained with the spectral data is quite similar to those obtained with the data collected with the trained sensory panel.

Evidence exists that NIR spectroscopy is suitable as an easy and quick technique for assessing volatile phenols contents of volatile phenols as well as a promising one to access the sensory profile of aged wine spirit. Furthermore, NIR spectroscopy is a potential tool for assessing sensory profiles in aged wine spirits.

Keywords: Volatile phenols; Sensory profile; NIR; Chemometrics; Aged wine spirit

TRADITIONAL AGRIFOOD PRODUCTS AND SUSTAINABILITY - A FRUITFUL RELATIONSHIP TOWARDS THE DEVELOPMENT OF RURAL AREAS

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In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

ABSTRACT BOOK: INTERNATIONAL WEB CONFERENCE ON FOOD CHOICE & EATING MOTIVATION

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The importance of protection of agrifood regional products is taking a growing importance in a market dominate by global companies and brands, often without personality. Indeed the EU agricultural product quality policy, introduced in 1992 on the protection of geographical indications and designations of origin schemes, and presently governed by the Council Regulation (EC) 1151/2012 on the promotion of Protected Geographical Indications (PGI) and Protected Designations of Origin (PDO) for agricultural products and foodstuffs, aims to highlight the quality of products resulting from a specific origin and/or traditional production method, helping therefore in their communication and positioning in the market.

The attention with local and regional production is also highlighted by the United Nations, which in 2015 adopted the Agenda 2030 and the 17 Sustainable Development Goals (SDGs), with the aim to promote long-term prosperity. Particularly the SDGs 12 “Responsible Production and Consumption” and 15 “Life and Land”, are particularly relevant in the understanding of the role of traditional products towards the development of the so-called less-favoured rural regions, mostly inland or mountain.

Bearing this in mind, according to the information present on the list of traditional products made available by QUALIFICA/oriGInPortugal (2018), the purpose of this paper is to present an overview of the distribution of traditional products (PGI and PDO) by regions in Portugal and discuss its economic, social and environmental sustainability.

Based on simple descriptive statistics, (with the exception of wines and spirit drinks), results show that Portugal has 141 products certified by PGI (74) and PDO (67). The North of Portugal region has a bigger percentage of traditional products certified, followed by Alentejo region and Centro region of Portugal. Looking for the type of products, from a list of 12 different types of traditional products, the ranking is dominated by 1) meat, 2) sausage and smoked products, 3) cheese and milk-based products and 4) fresh fruits.

If we consider that many of the aforementioned products are from less favoured regions, on the countryside, these results constitute an opportunity for their sustainable development, benefiting not only producers, but also consumers who increasingly seek authentic products. However, for the success of the dissemination of traditional products in the country, it is needed a closest collaboration between entities with different skills, with big focus on the region's social and economic agents (e.g. farmers).

Keywords: Traditional agrifood products; Sustainability; Rural development; Portugal

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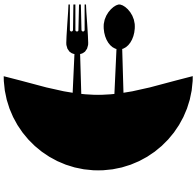
The International Research Project EISuFood - Edible insects as sustainable foods.



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THE INTERNATIONAL RESEARCH PROJECT EISUFOOD - EDIBLE INSECTS AS SUSTAINABLE FOODS

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In recent years, insects have been suggested as an alternative source of animal protein, and a more sustainable way to provide the needs in protein of the growing world population. Edible insects are nutritive foods, rich in macronutrients and particularly protein and fat, but also contain micronutrients important for many body functions, such as vitamins and dietary minerals. The project "EISuFood – Study about food habits and knowledge about edible insects as sustainable foods" is developed in different countries and aims to study the habits, knowledge, and perceptions of consumers in different social and cultural contexts to edible insects.

The project was approved by the CERNAS-IPV Research Centre at the Polytechnic Institute of Viseu, in December 2020, and the Principal investigator and leader of the international team is Raquel Guiné. The project involves a total of 69 researchers in the 18 participating countries (Brazil, Cape Verde, Colombia, Croatia, Greece, Latvia, Lebanon, Lithuania, Mexico, Morocco, Nigeria, Poland, Romania, Serbia, Slovenia, Spain, Turkey, with Portugal being the leader country).

The project involves four tasks as follows: 1. Preparation of the instruments for data collection; 2. Collection of data in the 18 countries; 3. Analysis of the data; and 4. Preparation of scientific outputs and dissemination of results. The questionnaire used in the project addresses seven different dimensions: Culture and Tradition, Gastronomic Innovation and Gourmet Kitchen, Environment and Sustainability, Economic and Social Aspects, Commercialization and Marketing, Nutritional Aspects and, finally, Health Effects. The questionnaire was prepared by the whole international team and approved by the Ethics Committee of the Polytechnic of Viseu with Reference No. 45/SUB/2021. An initial screening involved the validation for the Portuguese sample1, before global application in all countries. The validation of this questionnaire confirms its usefulness for investigating consumer perceptions of and knowledge about edible insects, making possible its application in different countries.

Keywords: Edible insect; Questionnaire survey; Sustainability; Culture; Tradition

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Studying the psycho-social motivations associated with food choices and eating practices – the EATMOT project.

STUDYING THE PSYCHO-SOCIAL MOTIVATIONS ASSOCIATED WITH FOOD CHOICES AND EATING PRACTICES – THE EATMOT PROJECT

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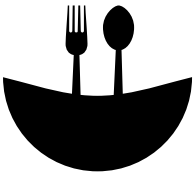

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The food act unfolds according to rules imposed by society, influencing food choice. These factors can encompass the environment, which is related to available resources and social relationships, as well as individual history. Thus, considering the values of the social group in which the individual is inserted, the construction of cultural identities and individual differentiation, the human eater selects the available natural resources and transforms them into food for consumption as a way to meet the needs of the individual. The project "EISuFood – Study about food habits and knowledge about edible insects as sustainable foods" was developed in different countries aiming to study the different psychic and social motivations that determine people's eating patterns, either in relation to their choices or eating habits, particularly considering these areas: health motivations; economic factors; emotional aspects; cultural influences; marketing and commercials; environmental concerns.

The project was approved by the CI&DETS Research Centre and the Polytechnic Institute of Viseu, and consisted of 18 countries, from which only 16 were successful in completing all the project specifications: Argentina, Brazil, Croatia, Cyprus, Egypt, Greece, Hungary, Italy, Latvia, Lithuania, Macedonia, Netherlands, Poland, Portugal, Serbia, Slovenia, Romania, United States of America. The project team was composed of 74 researchers in global, and was directed by the Portuguese partner (chief: Raquel Guiné). The methodology included several tasks: 1. Undertake a questionnaire survey- Prepare a questionnaire purposely for this research; 2. Translate the questionnaire to the native languages of all countries; 3. Apply the questionnaire to collect data in all countries; 4. Build a database with data from all countries; 5. Treatment of the data (•Treatment considering all countries involved, •Treatment considering some countries, •Treatment for one country isolated). The results of the project were disclosed through different types of outputs, namely: – Publication of PAPERS in scientific peer reviewed journals – 36 papers (30 published, 2 accepted, 4 under preparation); – Publication of CHAPTERS in scientific books – 15 chapters published; – Publication of BOOKS – 3 books published (1 in Portugal, 1 in Hungary, 1 in Switzerland); – Participation in CONFERENCES – 21 presentations (1 Invited Keynote, 13 oral communications, 7 poster presentations- 1 Best Porter Award); – Academic Works – 4 Works (1 Master Thesis, 3 Graduation works); – 1 website: https://raquelguine.wixsite.com/eatmot.

In conclusion the project showed that: •Age significantly influenced the eating motivations, especially relating with health and emotions; •Women and men have contradictory behaviours towards economic & availability and social & cultural motivations; •The strongest factors determining health motivations were age and country; •Emotional motivations were determined by living environment and country; •For economic & availability motivations, the highest influential factors were gender and living environment; •The Social & cultural motivations were highly variable with country, living environment and professional area; •For environmental & political motivations, country had the highest influence; •Marketing & commercial motivations were strongly determined by country and living environment.

Keywords: Eating motivation; Food choice; Healthy food; Questionnaire survey

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(pp. 40-40)

ANTIMICROBIAL PROPERTIES OF LACTIC ACID BACTERIA ISOLATED FROM HOMEMADE CHEESE IN NORTH MACEDONIA

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Food safety is one of the major concerns in public health due to outbreaks of food-borne diseases. Consumers have become concerned about the safety of synthetic preservatives used in food. As a result, there is increasing demand for natural products that can serve as alternative food preservatives. In fermented foods, lactic acid bacteria with antimicrobial activity could be used as natural bio-preservatives to prevent or inhibit the growth of pathogenic and perishable bacteria and fungi. In the present study, a total of three LAB isolates were screened for the inhibitory effect using well diffusion agar method. The antifungal and antibacterial activities were investigated using two fungal and one bacterial test organisms.

Results showed that two out of three LAB isolates demonstrated antifungal activity against Candida albicans ATCC 10231 and *Aspergillus niger* ATCC 16404, while only one isolate showed antibacterial activity against Salmonella enterica ATCC 10708. This study shows that LABs from homemade cheese possess considerable antimicrobial activity against tested microorganisms.

This preliminary work provided a base and illustrated one of many possible applications of LABs as a probiotic candidate. The development of multistrain probiotic dairy products with improved characteristics, able to act as probiotics and to exert a protective action against infections, has gained increased interest.

Keywords: Lactic acid bacteria; Antifungal activity; Antibacterial activity; Homemade cheese

Marques, C., Correia, E., Dinis, L. T., Mota, J., Vilela, A. (2022).
Quantitative descriptive analysis as an analytical tool for the sensory characterization of Wine Vinegar.

QUANTITATIVE DESCRIPTIVE ANALYSIS AS AN ANALYTICAL TOOL FOR THE SENSORY CHARACTERIZATION OF WINE VINEGAR

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Sensory science provides objective information about consumer understanding of a product, acceptance or rejection of stimuli, and description of the emotions evoked.

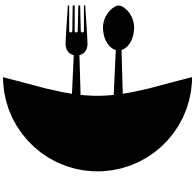
This research aims to create a sensory profile of three categories of wine vinegar (white wine vinegar, red wine vinegar, and Porto wine vinegar) from Douro and Rioja regions through Quantitative Descriptive Analysis (QDA). A trained panel of 15 panelists tasted twenty-two samples, fifteen from Douro and seven from Rioja.

In the first stage, the panel was invited to do specific training on vinegar. We prepared acetic acid solutions in aqueous and hydroalcoholic bases in different concentrations, and we asked the panel to rate the samples considering an intensity scale (from the less acid to the most acid).

Afterward, they assessed three standard samples, a white wine vinegar (sample 1), a red wine vinegar (sample 2), and a Porto wine vinegar (sample 3). The assessors freely generated sensory descriptive terms from these samples according to visual parameters such as color and clarity, olfactive parameters like smell and aroma, and taste parameters. A QDA test sheet with a 5-point scale (1-non detectable attribute to 5-clearly detected attribute, with intensity superior to the reference) was created based on a previous screening by reference frequency.

The data were treated by SPSS Software, and the results were very coherent. White wine vinegar, red wine vinegar, and Porto wine vinegar showed clear differences among them in all parameters (visual, olfactive, and taste). The results revealed that QDA has evident ability and reliability to identify sensory profiles of wine vinegar.

Keywords: Quantitative descriptive analysis; Trained panel; Wine vinegar; Sensory profile; SPSS software



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(pp. 42-42)

WHAT DOES IT TAKE TO TRANSITION TO MORE SUSTAINABLE EATING IN SCHOOLS? STAKEHOLDERS' PERSPECTIVES

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Shifting to healthier and more sustainable food systems is a complex endeavor. Recent research has highlighted the need to adopt integrated and systemic frameworks to understand and promote behavior change at a larger scale. In this study, we focused on the school meals system as a key context for promoting more environmentally friendly eating practices, namely by increasing the choice of plant-based meals. Individual interviews were conducted with stakeholders at different levels of influence in the school meals system in Portugal (i.e., proximal, intermediate, distal; from end-consumers to food providers, market actors, civil society organizations, and policy and decision-makers). Data from individual interviews (N = 33) were subjected to thematic analysis. The perspectives of stakeholders allowed the identification of several barriers and opportunities for transitioning to more sustainable eating practices in schools. The main pathways to unlock this transition included (1) Levering orientations toward ethical and environmentally beneficial consumption; (2) Improving and increasing the offer of plant-based meals; and (3) Mobilizing local communities and society. These main pathways comprised several subthemes. The first pathway referred to linking food consumption with environment and animal ethics. The second main theme included concerns over the nutritional quality and sensory appeal of plant-based alternatives, overcoming provision-related challenges and promoting staff training and increasing food literacy. Lastly, the third pathway included social (social representations of eating and nutrition), political (prioritizing school meals), financial (tackling economic and financial barriers), and community-wide determinants (fostering the active engagement of students, parents, and teachers). Overall, these findings seem to suggest that promoting healthier and more sustainable food practices in schools requires systemic, integrated efforts, involving different actors and encompassing the various levels of the food system.

Keywords: Sustainable eating; School meals; Plant-based meals; Stakeholders

Bolha, A., Molac, E., Kuhar, A., Korošec, M. (2022).
Influence of individual taste sensitivity on food preferences of female Food science and Nutrition students.

INFLUENCE OF INDIVIDUAL TASTE SENSITIVITY ON FOOD PREFERENCES OF FEMALE FOOD SCIENCE AND NUTRITION STUDENTS

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Taste sensitivity may influence the development of food preferences in individuals that affect their food consumption and health. In this study, various individual sensory properties and their relationships to food preferences were investigated in 28 young female students of Food science and Nutrition study programmes (age mean 23±3 years).

Individual taste sensitivity was measured by assessing the bitterness of 6-n-propylthiouracil (PROP; 0.32 mmol/L) and the perceived intensity of the basic tastes (sweet, sour, bitter, salty, umami) on the LMS scale and by determining individual recognition and detection thresholds for sweet and salty tastes using the 3-AFC method. For attaining fungiform papillae (FP) density (FP /cm2), high-resolution smartphone photography was used. FP density was calculated manually according to the Denver papillae protocol, and subjects were divided into low (29%), medium (46%), and high (25%) FP density groups. Based on PROP taster status, 64% of participants were identified as super, 18% as medium, and 18% as non-tasters.

No difference was found in the perceived intensity of the basic tastes (sweet, salty, bitter, sour, umami) or in the detection and recognition thresholds for the salty and sweet tastes between subjects with different PROP taster status or different FP density. There was also no difference in PROP taster status between subjects with different FP densities. Nevertheless, a statistically significant difference ($p < 0.05$) was found between the FP density groups and their preferences for high sugar and high fat foods. Those with high density FP rated high sugar beverages and high fat foods as likable and tasty, while those with low density FP rated them as not likable and not tasty.

These results suggest that the density of FP may play a role in the liking of and preference for certain foods among young female students. Nevertheless, the influence of FP density and PROP taster status on food preference is still controversial, debatable, and quite unclear.

Keywords: Taste sensitivity; Food preferences; Fungiform papillae; PROP

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(pp. 44-44)

NATURAL AND ANTHROPOGENIC CONTAMINANTS IN RAW BOVINE MILK: A COMBINED RISK?

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Milk plays an important role in the human diet, especially in vulnerable groups such as children and the elderly, due to its rich composition in micro and macro-nutrients. Most of the worldwide milk production is related to cattle, with increasing consumption rates. Nonetheless, raw milk consumption has been increasing in the European Union, especially between health-conscious people, being consider as having possible health benefits which can be diminished by industrial processing. This consumption patterns can lead to eminent hazards on human health due to the exposure to different contaminant sources in this single food product. The main contamination route of raw milk usually occurs through the animal by consumption of naturally contaminated feed (e.g. mycotoxins) but can also occur due to the use of veterinary drugs for promotion of growth and treatment of livestock (e.g. antibiotics), or even in consequence of contaminated milking equipment, milking personnel, manure, or dirty stalls (e.g. *Staphylococcus aureus* and their enterotoxins). At each stage of the milk production process there is a susceptibility to various sources of contamination and, therefore, it is crucial to perform integrated assessments to fully understand the health risks associated to the high intake of this food product, and to establish efforts aiming at the development of proper risk management plans, and effective prevention and mitigation strategies, thus providing a higher quality of this product.

Consequently, this study was focused at performing a qualitative characterization of the contamination profiles in terms of enterotoxins, mycotoxins, and antibiotics in raw milk samples from Portuguese dairy farms. One-hundred raw milk samples were collected from the main dairy region of mainland Portugal corresponding to 100 dairy farms, between the years 2020 and 2021. Sampling was performed directly from bulk milk cooling tanks, in sterile labelled screwed top bottles, in a 1 L-volume, and stored at-20±2ºC, until further analysis. Subsamples were taken for analysis of the 5 main staphylococcal enterotoxins (SEA to SEE), 23 mycotoxins (regulated and emerging mycotoxins), and 43 antibiotic residues from 7 different families (tetracyclines, sulphonamides, quinolones, penicillin, macrolides, cephalosporins and trimethoprim). For the presence of staphylococcal enterotoxins, samples were analysed by enzyme linked fluorescent assay (ELFA) according to ISO 19020:2017. For identification of mycotoxins and antibiotics, liquid chromatography coupled to mass spectrometry systems were used, namely UHPLC-QTRAP-MS/MS and UHPLC-TOF-MS, respectively.

Results concerning prevalence data revealed the presence of staphylococcal enterotoxins (SEA-SEE) in only one sample (1.0%), although it was observed a high prevalence of enterotoxigenic S. ***aureus*** (53.0%) in these samples. Antibiotics were also found in residual concentrations, lower than the maximum permitted residue levels. On the other hand, 97% of the samples were positive for at least one mycotoxin, with high prevalence of emerging mycotoxins. The SE-positive sample was also positive for three mycotoxins, namely beauvericin, enniatin B and fumonisin B2, being all associated with adverse effects on the gastrointestinal tract, and immunity response. Co-occurrence data in milk is very scarce, and continuous monitoring on multi-toxins' presence in such samples is essential protect consumer health, especially in a food highly consumed by age vulnerable consumers.

Keywords: Raw milk; Enterotoxins; Mycotoxins; Antibiotics; Food Safety

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Leicht, K., Siwak, S., Korzeniowska, M. (2022).
The effect of the addition of spirulina (Spirulina platensis) on the functionality and nutritional value of homogenized meat products.

THE EFFECT OF THE ADDITION OF SPIRULINA (*SPIRULINA PLATENSIS*) ON THE FUNCTIONALITY AND NUTRITIONAL VALUE OF HOMOGENIZED MEAT PRODUCTS

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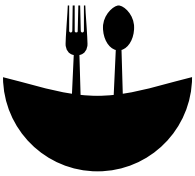
An unconventional food additive, increasing the nutritional value of meat products and positively affecting their lipids profile, can be dried spirulina biomass- algae rich in easily digestible protein, β carotene, potassium, magnesium, vitamins C, D, E and also B group. The aim of the project was to create a model product based on consumers expectations and to determine the effect of the addition of spirulina (*Spirulina platensis*) on the functionality and nutritional value of homogenized meat products.

Meat products were prepared from homogenized poultry and pork meat. In 4 experimental groups varied in the spirulina powder (commercially purchased Healthy Fields – exotic spirulina algae) addition from 0% for the control group to 2%. Meat muffins were subjected to the following analyses: color, pH, water holding capacity, nutrient and fatty acid profile In addition, consumer sensory evaluation of meat products was carried out.

Statistical analysis of the obtained results showed a significant ($p<0.05$) increase in product yield with the addition of powdered spirulina preparation, compared to the control sample. An effect on the content of nutrients in the thermally treated samples (baking) was also significant. Baked products enriched with spirulina were characterized by a higher ash, fat and protein contents than control one. An increase in the content of polyunsaturated fatty acids and selected B vitamins was observed in baked meat muffins prepared with spirulina addition. The products also differentiated the L* (lightness), a* (red/green coordinate), b * (yellow/blue coordinate) color parameters. The addition of spirulina caused a favorable change in the texture parameters (cutting force, elasticity, gumminess, chewiness) of the baked product and an increase in the pH of the baked product. The obtained results were confirmed by sensory analysis, the best assessment in terms of structure and consistency, as well as, in the general acceptance was recorded for fresh baked muffins with a 2% addition of spirulina. Summing up, it can be stated that spirulina could be a promising homogenized meat product nutritional value and sensory quality enhancer, with the addition not higher than 2%.

Keywords: Meat products; Spirulina algae; Superfood



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(pp. 46-46)

ALTERNATIVE COOKING METHOD ACCEPTANCE TO REDUCE OIL CONSUMPTION IN MILLENIALS

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Consumption of fat and oil based on group of age in Indonesia has the highest position for palm oil and coconut oil (92.6%). Most of its use is to fry food. This study aims to determine the types of cooking methods (boiling, steaming, griddling, and baking) to replace frying. The method used in this study was a survey (n=430) to determine the background of BMI, gender, and residence status of respondents followed by sensory test (n=60) to determine acceptance, appropriateness with other food (Indonesian soup) and intention-to-use for five cooking methods. The food model used is marinated tempe sized 4x3x1 cm (tempe bacem) as one of the common side dish.

The results showed there was a relationship between BMI (Body Mass Index) with the intention of respondents to reduce oil consumption ($p<0,05$). The higher the BMI value, the higher the respondent's intention to reduce oil consumption. Women had higher knowledge about oil than men ($p<0,05$). Respondents who did not live with parents had higher knowledge of oil than respondents who lived with parents ($p<0,05$). Sensory test results showed that there were no significant differences in the acceptance of product liking ($p>0,05$), appropriateness ($p>0,05$), and the intention to use of respondents towards the sample ($p>0,05$). Marinated tempe is not necessary to be fried. Panelists accept it whether it is boiled, steamed, grilled, or baked to replace the frying method because crispyness is not the main quality parameter for this type of food.

Keywords: Oil reduction; Cooking methods; Hedonic test; Sensory; Tempe; Body Mass Index

Muhammad, D. R. A., Marettama, N. M., Fauza, G., Affandi, D. R. (2022).
Can ingredients and information interventions affect the hedonic level and (emo-sensory) perceptions of the milk chocolate and cocoa drink's consumers?.

CAN INGREDIENTS AND INFORMATION INTERVENTIONS AFFECT THE HEDONIC LEVEL AND (EMO-SENSORY) PERCEPTIONS OF THE MILK CHOCOLATE AND COCOA DRINK'S CONSUMERS?

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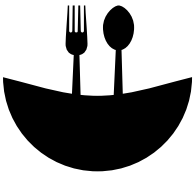
To increase the competitiveness of chocolate and cocoa drink in the market, innovation of the products is substantially required. Incorporation of additional ingredients, i.e., ginger and cinnamon, as well giving information intervention on their health effect may increase the consumer acceptance as well as advance the consumer perception on the products. This study, therefore, aims to determine the effect of additional ingredient and intervention on health-related information on the hedonic level, emo-sensory response and collative perception of panellists on milk chocolate and cocoa drinks which were enriched with additional ingredients such as spices (ginger and cinnamon) and stabilizers. This study used descriptive quantitative method in which the data were obtained from 40 panellists. Correspondence analysis was used to see the emo-sensory profile and panellist perceptions that were emerged from each sample. This study used 40 panellists. The results show that the addition of spices to milk chocolate and cocoa drinks resulted in a statistically significant decrease in the hedonic level. However, the use of stabilizer significantly improved the hedonic level of cocoa drink. The hedonic responses, emotions and collative perceptions of the panellists were influenced by the product information, particularly on the products with the addition of spices.

Keywords: Milk chocolate bar; Chocolate drink; Information intervention; Collative perception



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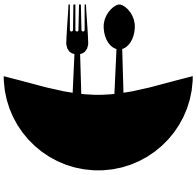
(pp. 47-47)

Lima, M., Costa, R., Rodrigues, I., Lameiras, J., Botelho, G. (2022).
A narrative review about current perspectives on alternatives to meat and dairy products in food industry.



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(pp. 48-48)

A NARRATIVE REVIEW ABOUT CURRENT PERSPECTIVES ON ALTERNATIVES TO MEAT AND DAIRY PRODUCTS IN FOOD INDUSTRY

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The research and development of alternatives to meat and dairy products for human consumption has been increasing in recent years, as a response to growing concerns about environmental sustainability, public health and trending positions of ideological nature. In the context of alternatives to meat and dairy, there is a diversity of food products such as tofu, tempeh, seitan, pulses, algae, seeds, nuts and insects. Some other alternative products, such as milk drinks alternatives, mycoprotein, meat, fish and cheese analogues, require more research and new technical processes. The aim of analogues is to mimic the physical and sensory properties of animal origin products through fibrous composition and mix of ingredients from vegetable sources. Our work reviewed the literature to systematize the main technological processes used in the production of meat and dairy alternatives and the properties of these products. From a total of 310 scientific papers identified in databases, such as b-on, PubMed and Science Direct, 194 papers were considered. Most of these research papers are focused on products such as insects, algae, and alternatives of milk. On the other hand, there are products that need more research, as is the case of mycoprotein, artificial meat, and alternatives to meat and dairy products. A general scheme that brings together the main reasons, resources, and challenges that the food industry faces in this promising area of alternatives to meat and dairy products is also showed.

Keywords: Meat alternatives; Dairy alternatives; Food industry; Analogues; Vegetable sources

Postuvan, V., Postuvan, V. (2022).
The psychosocial perception of healthy eating among young people in Slovenia.

THE PSYCHOSOCIAL PERCEPTION OF HEALTHY EATING AMONG YOUNG PEOPLE IN SLOVENIA

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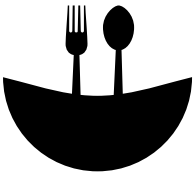
Gain weight and unhealthy diet represent one of the most important risk factors related to young people's health. But the promotion of healthy nutrition is not an easy task due to the complexity of behavioural eating-patterns. The Theory of planned behavior (TPB) helps us to address this issue through a psycho-social perspective. The aim of the current study was to assess the healthy eating with the emphasis on the different dimensions of the TPB, in particular attitudes, norms and the perceived control. An online three-dimensional questionnaire with satisfactory reliability was developed for the aims of this study assessing attitudes (Alpha = 0,71), norms (Alpha = 0,61) and the perceived control (Alpha = 0,69) in regards to healthy eating. The participants were invited to voluntarily join the study through their official email addresses in February and March 2022. 114 young people with mean age 18,59 (SD = 2,25) years took part in the study; 21,9% of these male and 78,1 females. The independent sample t-test comparing both genders showed females had statistically significantly (p=0,05) higher averages than males (5,13 vs. 4,73) on the attitudes, but did not differ with regards to norms or perception of control. The correlational matrix revealed statistically significant positive and moderately high correlations between all three questionnaire dimensions ($r_{attitudes\text{-}norms}$=0,21, $r_{attitudes\text{-}control}$=0,45, $r_{norms\text{-}control}$=0,24). Moreover, attitudes also correlated moderately high and in negative way with BMI ($r_{attitudes\text{-}BMI}$=-0.21). Based on these findings we can conclude that the attitudes play significant role in addressing young people's healthy eating. Therefore, a thoughtful communication could be a key to persuade young people for more positive eating choices and diet patterns. The conducted study provides the foundations for a better nutrition policy, and a better and more targeted communication on healthy eating (especially among young people) and can contribute to a healthier society.

Keywords: Healthy diet; Psychosocial factors; Theory of planned behavior; Attitudes; Gender; Body mass index



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(pp. 49-49)

Juchniewicz, S., Kopeć, W. (2022).
Strengthening the technological importance of poultry side-stream by creating protein hydrolysates in the autolysis process.

STRENGTHENING THE TECHNOLOGICAL IMPORTANCE OF POULTRY SIDE-STREAM BY CREATING PROTEIN HYDROLYSATES IN THE AUTOLYSIS PROCESS

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In recent years, in Poland and worldwide the consumption of poultry meat and its products increased significantly. It also increases the volume of by-products of slaughtered birds, such as skin, bones, cartilage, blood, inedible guts, chicken feathers and feet. These side-stream materials contribute to environmental pollution as their disposal is quite a challenging and carries high costs. One of the ways of their use is the production of protein preparations, including hydrolysates, which are widely utilized in the food industry and in animal nutrition. The main objective of the study was to develop a quick, simple, cheap and effective method of producing protein hydrolysates from inedible poultry slaughter side-stream materials. The process of proteolysis of these valuable materials was optimized, in this case the guts and heads of broiler chickens in two time regimes (1 and 2 hours), three pHs (2.75; 4.5 and 6.0) and three temperature variants (22, 37 and 60°C). The chemical composition of raw materials was analyzed. Then the study was conducted to check the degree of protein degradation and recovery of glycosaminoglycans and their antioxidant properties. The results showed that endogenous proteolytic enzymes present in the gut accelerated the proteolysis process. The best hydrolysis effect was observed for the intestinal preparations at 22 and 37°Cat pH 6.0, the same hydrolysates also showed the best antioxidant properties. The obtained protein preparations can be used in the feed industry as an additive enriching the feed of farm and domestic animals with amino acids and easily digestible short peptides, improving their nutritional value.

Keywords: Poultry viscera; Protein hydrolyzate; Autolysis; Broiler; Poultry

Dimakopoulou-Papazoglou, D., Mamougiorgi, P., Stefanou, D., Katsanidis, E. (2022).
Quantitative detection of beef, pork and chicken in meat mixtures using FT-NIR spectroscopy.

QUANTITATIVE DETECTION OF BEEF, PORK AND CHICKEN IN MEAT MIXTURES USING FT-NIR SPECTROSCOPY

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Meat and meat products are commonly consumed worldwide because of the essential nutrients and excellent source of proteins they provide. Beef meat has been a target for adulteration, because of its high cost and high demand by the consumers. Near infrared (NIR) spectroscopy has been successfully used to quantify meat composition, i.e. moisture, proteins and fat, but typically, mid-infrared (MIR) spectroscopy has been proposed for the detection of adulteration of beef meat, requiring additional, expensive equipment.

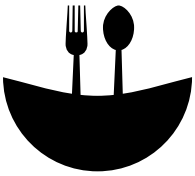
The aim of the present work was to develop a rapid and non-destructive method for the detection of pork and chicken meat in minced beef mixtures using FT-NIR spectroscopy. Beef meat mixtures containing different proportions (0, 25, 50, 75, 100% w/w) of pork and chicken meat were prepared. Two experiments were conducted and 8 samples for each treatment were analyzed. In addition, to take into account the fat content, pork mixed with different percentages of pork backfat (5, 10, 15, 20, 25, 40, 50% w/w) was analyzed. FT-NIR spectra of the samples were acquired using a Jasco FTIR 6700 spectrophotometer equipped with a PIKE NIR integrating sphere. The resulting full spectra (10000 – 4000 cm-1) and selected ranges were analyzed using multivariate analysis techniques to identify and quantify chicken and pork meat addition into beef meat.

The analysis of the spectra showed that the regions 8450 – 8200, 6900, 5800 – 5500, 5200 – 5100 and 4600 – 4200 cm-1 provide effective differentiation for meat adulteration. In addition, blends with different percentages of pork and pork backfat helped to better identify the peaks related to fat content. Principal Component Analysis (PCA) showed the similarities and differences among various mixtures of meat and Partial Least Squares Discriminant Analysis (PLS-DA) demonstrated a good discrimination between binary mixtures containing beef, pork and chicken blends. The PLS-DA with full spectra provided the greatest results with classification rates of 100% for all binary mixtures. Thus, the observed spectral variances between different meats can be used to predict their concentration in the mixtures. For each combination of meats, Partial Least-Square Regression models were bult for predicting the adulteration level, achieving correlation coefficients of 0.879 – 0.925 and root-meat square error of prediction of 7.22 – 9.78.

The results of the FT-NIR spectroscopy confirm that this technique can provide an alternative method to determine the adulteration of meat products and may be utilized by the food industry.

Keywords: Meat adulteration; FT-NIR spectroscopy; Beef; Pork; Chicken; Pork backfat; PCA; PLS-DA

Acknowledgments: Dafni Dimakopoulou-Papazoglou would like to thank the Greek State Scholarships Foundation (IKY). This research is co-financed by Greece and the European Union (European Social Fund- ESF) through the Operational Programme «Human Resources Development, Education and Lifelong Learning» in the context of the project “Reinforcement of Postdoctoral Researchers – 2nd Cycle” (MIS-5033021), implemented by the State Scholarships Foundation (IKY).



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(pp. 51-51)

Isoldi, K. K. (2022).
Tackling childhood obesity through nutrition education and culinary experiences.

In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

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(pp. 52-52)

TACKLING CHILDHOOD OBESITY THROUGH NUTRITION EDUCATION AND CULINARY EXPERIENCES

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Childhood obesity remains a persistent public health issue in developed countries and presents as an emerging issue in developing countries around the world. In the United States (US) childhood overweight afflicts one in three children while obesity prevalence is found in one out of five children. The physical and psychosocial detriments of obesity are broad and places a great burden on personal, community and national resources. Prevention measures are needed to change the trajectory of childhood obesity prevalence.

In the US children have been receiving fewer opportunities to learn cooking skills at home and in the school environment. Cooking skill attainment has been associated with improved food intake and health outcomes in several studies. These prior findings led to investigations aimed at improving nutrition education and culinary skill self-efficacy in youths.

Cooking Up Energy (CUE), a hands-on intervention program was designed with several goals in mind; 1) Maintaining/improving weight status, 2) Increasing meal preparation frequency at home, and 3) Promoting positive thoughts and attitudes held about healthy foods. CUE included a 10-week long program which provided hour long sessions to small groups (12-25 at a time) of children to prepare, taste and discuss the healthy recipe of the week. Nutrition student volunteers worked with the study participants in smaller groups of 3-4 children and conducted tableside discussions during recipe tasting using predetermined verbal prompts. This provided the children freedom to share their thoughts about the healthy foods tasted with each other, rather than being lectured to about healthy foods and behaviors.

Trained researchers collected the following pre- and post-program data for analysis; height, weight, body mass index, waist circumference, participation in meal preparation frequency survey and food knowledge and attitude survey. In addition, following completion of the program all participants recorded their responses to a program evaluation.

A total of 450 youths participated in the program over a seven-year period of time with outcomes reported yearly. Findings from years 1-3 are published, and years 4-7 are being analyzed. Each year (years 1-5) positive findings in all 3 areas of focus were found (weight status, meal preparation frequency and attitudes held about healthy foods). Outcomes from years 6-7 have not yet been assessed.

Interactive programs like CUE have the potential to provide children with the knowledge, skills and influence on attitudes held about healthy foods that can promote favorable change in food behavior. These changes can influence food choices and may ultimately assist in reducing childhood obesity prevalence.

Keywords: Childhood obesity; Culinary skills development; Nutrition education

A SEA OF OPPORTUNITIES FROM MARITIME PLANTS IN GASTRONOMY

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Global food demand is rising and serious questions remain about whether supply can increase sustainably (DeBenedetti, 2021; Food and Agriculture Organization of the United Nations, 2017).
Unlike terrestrial animal-based food products, the range of maritime plant-based products is massive. The number of maritime species – and the different types of food based on them around the world – surpasses all imagination, making for endless innovation opportunities. However, there are still plenty more challenges to overcome. For example, the development of ingredients and recipes for the various alternatives such as plant-based, and maritime flavors and aromas, is required.

We worked with several maritime or halophyte species, namely: *Sarcocornia perennis, Inula chritmoides* and *Halimione portulacoides* (Figure 1).

Figure 1- *Sarcocornia perennis, Inula chritmoides and Halimione portucaloides*

Only Salicornia has appeared in chefs' menus for more than 10 years, and while it has been commercialized since 2018 in Portugal, it has only been available in a few markets. The other maritime plants are mostly familiar to local populations and have recently became available to very exclusive markets.
Our main goal is to increase the use and consumption of these plants as an alternative source of nutrients and as a healthier replacement of salt. Since 2012, World Health Organization has aimed for a 30% reduction in mean population intake of salt/sodium, but still we are far from this achievement. Going forward, we believe that maritime plants play an extraordinary role in reaching this goal.

In our tests we found that the use of maritime plants in certain recipes not only contributes to the reduction of salt used and to the increase of the mineral profile and biological activity of food but also adds a more complex and aromatic flavor to the dishes. With this accomplishment we developed a menu under the motto *Less Salt Doesn't Mean Less Flavor*.
Under the frame of the Ideas4life Project entitled "Novos lngreDiEntes Alimentares de Plantas Maritimas" we propose several novel recipes. These recipes are presented and described, and further discussed in detail in this communication.

Keywords: Maritime plants; halophyte; Recipes; Socio-biodiverse gastronomy

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EVALUATION OF THE KEFIR POTENTIAL TO PRODUCE A FERMENTED PRODUCT FROM CHESTNUT PURÉE: A PRELIMINARY STUDY

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[2]Department of Analytical and Food Chemistry, Faculty of Sciences, University of Vigo, Spain

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The concept of functional food involves the food as a source of energy and nutrients, promoting a healthy benefit and reducing the disease risk. Kefir is a fermented beverage produced by a consortium of microorganisms (bacteria and yeasts) that live in symbiosis in the kefir grains. Several studies report many health benefits from the regular consumption of kefir, being considered a probiotic food.

Due to the lactose-intolerant people and the adoption of vegetarianism, there has been a growing concern about using non-dairy substrates, such as fruits and vegetables, to produce kefir-based products.

Chestnut fruits are mainly composed of carbohydrates (mostly starch and other sugars such as sucrose and, in fewer proportions, glucose, fructose and maltose) and, in less content, proteins with essential amino acids, dietary fibre, minerals, vitamins, phenolic compounds and a low amount of fat. Furthermore, it is an excellent alternative food for celiac people as it is gluten-free.

In this work, a preliminary study about the fermentation of chestnut purée by kefir grains was performed. A rheologic study of the chestnut purée was made to understand its flow behaviour at different temperatures (15, 25, 50 and 75 °C). A non-linear relationship between the apparent viscosity and shear rate was observed, describing a non-Newtonian behaviour. All samples demonstrated thixotropic properties, observed by a difference between the upward and downward curves. Moreover, it was determined the parameters of the Ostwald-De Waele and Hershel-Bulkley models, being concluded that the Hershel-Bulkley model described well the behaviour of the chestnut purée. The Arrhenius model well described a temperature dependency of the apparent viscosity.

The colony-forming units per millilitre (CFU/mL), pH, total sugars, lactic acid and acetic acid contents were determined during the fermentation. An increase in the counts of bacteria and yeasts was observed, as well as the production of lactic and acetic acids. On the contrary, a decrease in pH and total sugar concentration was determined.

Some bacteria and yeasts were isolated from the kefir fermentation. They were identified as L*euconostoc mesenteroides*, *Levilactobacillus brevis*, *Micrococcus luteus*, *Lentilactobacillus kefiri*, *Sporobolomyces ruberrimus*, and *Kazachstania unispora*.

In conclusion, the chestnut purée seems to be a suitable substrate for kefir fermentation producing a potential non-dairy product that can be consumed by lactose intolerant and celiac people.

Keywords: Fermentation; Kefir; Chestnut purée; Probiotics; Functional food

Duma, M., Alsina, I., Dubova, L., Erdberga, L. (2022).
Nutritional benefits of different colour and size tomatoes.

NUTRITIONAL BENEFITS OF DIFFERENT COLOUR AND SIZE TOMATOES

Mara Duma[1], *Ina Alsina*[1], *Laila Dubova*[1], *Ieva Erdberga*[1]
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Tomato (*Solanum lycopersicum* L.) is an important horticultural crop worldwide and one of the most consumed vegetables in the world. It plays an important role in nutrition because of its well-established health benefits.

Recently, there has been increasing interest in the nutritional value of fruits and vegetables, as consumers demand products with a high content of health-promoting constituents. In this respect, tomato is an important source of carotenoids such as β-carotene, a precursor of vitamin A, and lycopene, which has been associated with a reduction in the risk of cardiovascular diseases. Furthermore, tomato is also a good source of phenolic compounds such as flavonoids and vitamins such as ascorbic acid. All of these compounds contribute to its antioxidant properties and beneficial health effects.

The purpose of this study was to determine the relationship between the size and colour of tomatoes grown in greenhouse and their bioactive compounds.

Twelve tomato plant varieties with four colours of tomato fruits (red- `StrabenaF1`, `LancelotF1`, `BerberanaF1`, pink- `RhiannaF1`, `FujiPinkF1`, `Pink OxheartF1`, brown- `Black CherryF1`, `ChocostarF1`, `ChocomateF1` and yellow-` OrgangstarF1`, `OrganzaF1`, `BolzanoF1`) and each colour in three sizes (cherry-average mass of fruits 17.1 ±2.21g, middle – 95.3 ±4.49 g and large – 163.6±4.87 g) were grown in plastic film greenhouse without additional lighting from 1st of May until 1st of October 2021. All fruits were harvested at fully ripening stage. The content of total acids and soluble solids, as well as the content of lycopene and β-carotene, total phenolics and flavonoids were determined, and taste index was calculated.

The obtained results showed that there were significant differences in the mean values between analysed parameters according to the colour and size of fruits.

The content of lycopene and β-carotene changed as follows: red>pink>brown>yellow. The highest content of lycopene was observed for variety `Strabena` (cherry), `Rhianna`(cherry) and `Chocomate` (large)– 4.37±0.09, 4.16±0.11 and 3.87 ±0.07 mg $100g^{-1}$ fresh weight (FW), respectively.

The content of total phenolics and flavonoids changed as follows: yellow >brown>red>pink. In both cases the highest content of these biologically active compounds was found in cherry type tomatoes – variety Organgstar contained 52.95± 1.25 gallic acid equivalents (GAE) $100g^{-1}$ and 7.8 ± 1.07 catechin equivalents (CE) $100g^{-1}$ FW.

The highest content of soluble solids (6.67±0.01 Brix) was observed in red and brown cherry tomatoes, but regarding taste index, the trend was as follows: red>brown>yellow>pink. The smaller and bigger size tomatoes are recognized by consumers as more tasty comparing with medium size tomatoes.

For consumers who like milder tomatoes, yellow fruit is recommended due to the lower acidity. However, pink, red and brown tomatoes may be interesting for consumers as rich sources of the well-known antioxidant lycopene. Despite the colour, the cherry type tomatoes are tastier and richer in bioactive compounds.

Keywords: Lycopene; Phenolics; Taste index; Tomato variety

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(pp. 56-56)

GOOD PRACTICES IN FOOD PRODUCT DEVELOPMENT PROCESSES: SOME KEYS TO MOTIVATING THE CONSUMER

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Good practices, on one hand, whether from good laboratory practices (GLP), good hygiene practices (GHP), good kitchen practices (GKP), good manufacturing practices (GMP), to good transportation practices (GTP), are vital for and within the food production supply chain. Food product development processes, on the other hand, entails major steps that builds up its pathway, regardless of the specific (food) product in question. However, what consumers either should and or would see and derive motivation from, especially towards a given food product, for instance when there are about to make a purchase, makes it needful to identify areas where good practices play key role in food product development processes. This would potentially provide consumers a better perspective and understanding about some key food product development processes that take place, which cumulates to a highly valued product. In this presentation, good practices in food product development processes is relayed, with emphasis on some keys that could help motivate the consumer. The import is to reiterate good practices in the food production supply chain. It is widely understood that food product quality is clearly championed by good practices within the food production supply chain. More so, good practices and how it connects with food product development processes should serve as a platform for future debate by researchers and stakeholders.

Keywords: Good practices; Food product; Food production supply chain; Consumer motivation; Stakeholder participation

Faria, B., Lima, J. P. M. (2022).
Food pattern, binge eating, and weight status in shift workers from health and social area.

FOOD PATTERN, BINGE EATING, AND WEIGHT STATUS IN SHIFT WORKERS FROM HEALTH AND SOCIAL AREA

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Introduction: Shift work has negative effects on the physical, psychological and psychosocial health of workers in this work regime, as well as on their professional performance. The influence of shift work on metabolism and eating behaviors has been associated with the prevalence of obesity and chronic diseases. Workers from health and social areas will be shift workers most of the time, considering the characteristics of the services involved.

Purpose: To characterize the eating pattern, binge eating and weight status in shift workers in the health and social areas.

Materials and methods: An analytical observational study was conducted, with data collection through an online questionnaire, and statistical treatment was performed using the software Statistical Package for the Social Sciences. The sample of 179 shift workers was obtained by convenience. Every ethical procedure was considered.

Results: It was observed a low adherence to the Mediterranean Diet among workers in the sample (11.2%), and a significant incidence of overweight or obesity (50.2%) as well as binge eating disorder (27, 9%). The workers with a higher incidence of binge eating disorder present higher body weight.

Conclusions: Shift workers present a low adherence to the Mediterranean Diet, binge eating disorder, and are overweight. Shift work will always be practiced in the health and social area and as this is a health risk factor, it is necessary to alert these professionals and provide information and strategies to combat the associated risks.

Keywords: Shift workers; Mediterranean diet; Binge eating disorder; Obesity

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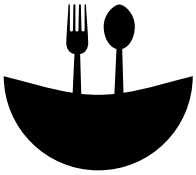
Boustani, N. M., Guiné, R. (2022).
Food determinants and motivation factors impact on consumer behavior in Lebanon.



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FOOD DETERMINANTS AND MOTIVATION FACTORS IMPACT ON CONSUMER BEHAVIOR IN LEBANON

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The current study examines a number of elements that influence eating habits. This is about internal and external elements that lead to a full examination of consumer behavior, with a focus on motivating factors and barriers that have a significant impact on individual consumers' food choices. The database is based on a questionnaire study of traditional and fiber food intake, as well as individual customer buying habits. Analysis of qualitative aspects and other statistical approaches were used to analyze the findings of the questionnaire survey. Based on the findings, individual eating motivation and its effect on customers' decision-making behavior while purchasing foods were identified in Lebanon. Information, the social setting, and the environmental characteristics are sources of potential influences. The interactions between these elements, as well as food preferences and eating behavior, are shaped by processes such as social learning. As a result, future initiatives to promote healthy eating habits may benefit from a greater focus on learning principles and food preferences in the implementation of initiatives.

Keywords: Food determinant; Consumer behavior; Food motivation; Fiber food

Abreu, B., Pereira, H., Lima, J. PM. (2022).
The theory inside of the lupin bean and (its) future in food systems – Review.

THE THEORY INSIDE OF THE LUPIN BEAN AND (ITS) FUTURE IN FOOD SYSTEMS – REVIEW

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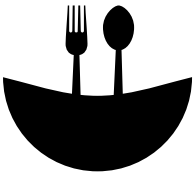
With the expansive population, the demand for dietary protein is increasing globally and the main challenges for the food supply systems are also to provide protein that would be of high quality, health-promoting, and sustainable. One of the sustainable sources of dietary proteins are plants, in particular the *Leguminosae* family. Specifically, *Lupinus* comprises more than 200 different species. Conversely, only the four known as the sweet lupin group have gained relevance to be utilized in human food production for their low levels of alkaloids contained in their seeds. These four species include *Lupinus albus* (typical white lupine), *Lupinus angustifolius* (known as blue lupin or narrow-leafed lupin), *Lupinus luteus* (the yellow lupine), and *Lupinus mutabilis* (common pearl or Andean lupin).

Literature review was conducted. Scientific articles were analysed from 2018 to 2022 in scientific databases such as *ScienceDirect* and *Pubmed*. Keywords such as "Lupin" OR "Lupinus" AND "Nutrition" AND "Sustainability" AND "Food systems" OR "Agriculture" were used. For scientific research, systematic reviews were valued on the topic in question.

The safety properties of lupin ingredients include the development of biogenic amines and the presence of allergens. Lupin bean allergy is still relatively unusual, only a limited number of adverse events associated with the ingestion have been reported, but cross-reactivity between peanut and lupin occurs. Therefore, conglutins such as-α,-β,-γ, and-δ are candidate lupin allergens. Considering the high severity of allergic reaction to peanut, the cross-reactivity of new lupin derivatives needs to be carefully assessed, and commercially processed lupin products properly labeled, to minimize the danger for potential allergic consumers.

Lupin shows a good water binding capacity what demonstrate that the functional properties of lupin flours indicate that could contribute desirable attributes to a wide range of food products. Additionally, the high protein content of this underutilized flour suggests that could serve as cheap and alternate source of proteins. There is enormous potential market demand for lupin-based products, with niches in growing sectors, for example vegetarians, vegans, and people with intolerance or allergy to gluten, soya, milk, or egg. The inclusion of lupin ingredients as a source of protein for human consumption depends mainly upon their nutritional quality, but moreover on their ability to be used as, or incorporated into, foods that will be readily consumed. Further studies are required to investigate protein functionality of the lupin bean in composite with others food products and in food systems.

Keywords: Lupin; Lupinus; Nutrition; Sustainability; Food systems; Agriculture



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INFLUENCE OF SHIFT WORK ON THE EATING HABITS AMONG WORKERS FROM INDUSTRIAL COMPANIES

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Introduction: During the last decades, the proportion of shift work has been increasing, manifesting a change in the pattern of food intake, leading to inadequate eating habits. Shift workers are individuals more prone to the development of chronic non-communicable diseases.

Purpose: Assess the influence of shift work on the eating habits of workers in industrial companies.

Materials and methods: A questionnaire was adapted and applied, based on Diana Barreto's master's thesis questionnaire and the Food Frequency Questionnaire[1]. An observational study was conducted, and 228 workers were involved in the research, of which 148 were shift workers (TT) and 80 were daytime workers (TN). The data obtained was entered and processed in SPSS. Every ethical procedure was considered.

Results: According to the WHO[2], shift workers have a higher percentage of overweight (45.3%) and obesity (15.5%) than daytime workers. In addition, shift workers have breakfast, lunch, afternoon intermediate meal and dinner less frequently, compared to daytime workers. Regarding the frequency of consumption of sweet (22,9% TT consume daily) , savory, stuffed and smoked foods (52% TT consume 1-4x per week), red meat (62,8% TT consume this 2-4x per week, which means that in the most of days their meals are made up of this food), fried foods (68,9% TT refers consume 1-4x per week) and soft drinks (22,3%TT consume 1x per day), this study demonstrates that shift workers have a higher intake of these foods compared to daytime workers, to the detriment of foods such as fruits, vegetables and fish. The diseases most frequently reported by shift workers were Hypertension (HTA) (20.9%/0%), overweight (26.4%/ 11,3%), obesity (6.8%/0%) and high cholesterol level (24.3%/8,8%), compared to daytime workers. On the other hand, diabetes is more prevalent in daytime workers (13.8%), compared to daytime workers (5,4%).

Conclusions: Shift workers consume a greater quantity of processed foods compared to daytime workers. In contrast, the intake of fruit and vegetables was lower among the shift workers.

Keywords: Shift workers; BMI; Food consumption; Chronic diseases

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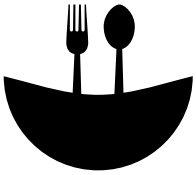
Poster Communication



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VALORIZATION OF THE AVOCADO SEED FOR THE FORMULATION OF FUNCTIONAL FOODS

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Currently, avocado by-products, such as the skin and the seed, are not used since they are believed to have few industrial uses. These by-products are considered organic waste that can have an environmental impact if not handled properly. For its part, the seed, despite being thought as by-product, it has nutritional characteristics similar to those of the pulp, which makes it a striking raw material to be used in the food industry. Therefore, the aim of this study was to evaluate the nutritional composition of the flour obtained from Hass avocado seeds in order to formulate cookies that were analyzed by a consumer panel. The results showed that avocado seed flour had 45.16% ± 0.09% of moisture, 27.73% ± 0.15% of fat, a high fiber content (23.66% ± 0.05%), 1.57% ± 0.33% of protein and a high antioxidant capacity and content of phenolic compounds (185.45 ± 0.67 Trolox Equivalent/g and 6.3 ± 0.29 mg of gallic acid equivalent/g), respectively. After the analysis of the flour, it was confirmed that avocado seed flour had an important nutritional and functional content, thus it was incorporated in the design of functional cookies. The experiment consisted of four cookie formulations with substitution of wheat flour for avocado seed flour at 25%, 50%, 75% and 100%. A consumer panel with 50 participants was carried out to evaluate the different cookie formulations, assessing important characteristics such as texture, color, appearance, crispness, and overall acceptability. The sensory analysis indicated that the cookie most accepted by the consumer panel in terms of appearance, color, texture, and crispness was the cookie with a 25% substitution of wheat flour for avocado seed flour. Taking everything into consideration, it can be affirmed that the flour obtained from the Hass avocado seed has a wide potential to be used as a partial substitute for wheat flour due to its high nutritional value and high overall acceptability by consumers.

Keywords: Avocado seed; Fiber; Antioxidant capacity; Bioactive compounds; Sensory analysis; By-products

Mihaylova, D., Popova, A., Goranova, Z., Doykina, P. (2022).
Development of healthy vegan bonbons enriched with lyophilized peach powder.

DEVELOPMENT OF HEALTHY VEGAN BONBONS ENRICHED WITH LYOPHILIZED PEACH POWDER

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Changing nutritional demands in combination with the global trend for snacking sets a goal for preparing food products for direct consumption with certain beneficial properties. This study was designed in order to investigate the quality characteristics of raw vegan bonbons enriched with lyophilized peach powder. Three types of formulations were prepared where 10, 20, and 30% of lyophilized peach powder was respectively added.

The newly developed vegan products were characterized in terms of their physical (moisture, ash, color, water activity), microbiological, nutritional, and sensory characteristics. Their antioxidant activity and flavonoid, and phenolic content were also evaluated.

Considering the content of the bonbons health claims can be made – high in fiber, sources of fiber, with no added sugar, contains naturally occurring sugars. The color measurements demonstrated similarity in the values. The sensory characteristics of the products revealed that all formulations were accepted by the panelists. This study showed that there is a significant potential in the production of healthy snacks for direct consumption with beneficial properties.

Keywords: Health-enhancing; Raw snack; Health claims; Healthy ingredients

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(pp. 63-63)

Çelik, S., Costa, D. T. V. A., Çetin, S., Costa, C. A., Guiné, R. (2022).
Consumption of agricultural foods from organic farming: Insights from Portuguese versus Turkish populations during Covid-19 pandemic.

In C. Lima, A. M. Cunha, A. Pereira, R. Carvalho, Y. Dulyanska, R. Guiné (Coords.),

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(pp. 64-64)

CONSUMPTION OF AGRICULTURAL FOODS FROM ORGANIC FARMING: INSIGHTS FROM PORTUGUESE *VERSUS* TURKISH POPULATIONS DURING COVID-19 PANDEMIC

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Interest in organically produced food has steadily increased over the last few decades all around the world. The goal of this study was to determine to what extent the organic food consumption behaviours of individuals from Turkey and Portugal are shaped by five different types of determinants, namely: Consumption Habits, Determinants of consumption, Commercialization, Environmental and Social Impact, Pandemic versus Sustainable Products. Data was collected using a questionnaire administered through an online platform to adult citizens residing in their respective countries. For analysis were obtained 308 valid questionnaires.

The results indicated that, when analysing the reasons for consumption of organic farming products in both countries, the strongest motivations were associated with health benefits and lower pollution. The most important factor pointed out not to consume organic food by the participants in both countries was their higher price as compared with the conventional counterparts. The results further showed that in Portugal people believe that a higher value is attributed by the society to the organic products, as compared with the perception in Turkey.

In conclusion, man-made and natural crises, such as biodiversity loss and COVID-19, are affecting our world, highlighting the need to move to more sustainable consumption. One approach to solve these issues is to increase the level of organic food consumed.

Keywords: Sustainable agriculture; Organic farming; Food consumption; Questionnaire survey; Covid-19

Florença, S., Costa, C. A., Correia, P., Ferreira, M., Duarte, J., Cardoso, A. P., Campos, S., Anjos, O., Guiné, R. (2022). Development of the EISuFood Questionnaire: Edible insects as sustainable foods.

DEVELOPMENT OF THE EISUFOOD QUESTIONNAIRE: EDIBLE INSECTS AS SUSTAINABLE FOODS

Sofia Florença[1], Cristina A. Costa[2], Paula Correia[2], Manuela Ferreira[3], João Duarte[3], Ana Paula Cardoso[4], Sofia Campos[4], Ofélia Anjos[5], Raquel Guiné[2]

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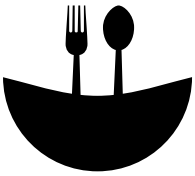
The regular consumption of insects has been reported as part of the traditional diet of more than two billion people in the world. Insects have demonstrated to be a more sustainable alternative than other sources of animal protein. Therefore, they are expected to contribute to diminish the pressure on the planet and on ecosystems in face of the growing need to feed the world population. Besides their role in the protection of the environment, edible insects also possess a good nutritional value and they are a source of bioactive compounds with some beneficial effects on the human body. However, in many Western societies the consumption of edible insects faces many challenges, due to some resistance and even neophobia. The objective of this work was to develop and validate a questionnaire to assess the knowledge and perceptions about edible insects.

The sample was composed of 367 Portuguese participants, all adults, who answered the survey online between July and November 2021. The data were used to undertake a statistical validation, based on reliability analysis, complemented with factor analysis. For all treatment the software SPSS version 26 was used.

The results showed that all the seven scales of the questionnaire were validated based on the values of the Cronbach's alpha: 1 – Culture and Tradition (α = 0.740), 2 – Gastronomic Innovation and Gourmet Kitchen (α = 0.901), 3 – Environment and Sustainability (α = 0.932), 4 – Economic and Social Aspects (α = 0.843), 5 – Commercialization and Marketing (α = 0.793), 6 – Nutritional Aspects (α = 0.912), 7 – Health Effects (α = 0.832). Additionally, the 64 items were grouped into fourteen factors, of which F1 and f2 were the most representative (corresponding to 28.0% and 7.7% of explained variance). Based on these results, the instrument was considered validated and can be further used to investigate the knowledge and perceptions about edible insects in different contexts, such as different countries, as it is intended in the ambit of the EISUFOOD project, taking place in 18 different countries simultaneously.

Keywords: Edible insect; Validation; Scale; Internal reliability; Factor analysis



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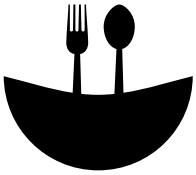
Milinčić, D. D., Pešić, M. B., Kostić, A. Ž., Demin, M. A., Pejić, L., Rabrenović, B. B., Laličić-Petronijević, J. G., Stanojević, S. P. (2022).
Total content of flavonoid and derivatives of dihydroxycinnamic acid of biscuits prepared with wheat and quinoa flour.



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TOTAL CONTENT OF FLAVONOID AND DERIVATIVES OF DIHYDROXYCINNAMIC ACID OF BISCUITS PREPARED WITH WHEAT AND QUINOA FLOUR

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The aim of this work was to determine the content of flavonoids and derivatives of dihydroxycinnamic acid of biscuits prepared with wheat and quinoa flour. Today, bioactive compounds have an increasing role in the diet of modern man. Flavonoid compounds and derivatives of dihydroxycinnamic acid are micronutrients in our diet for which it has been reported to have multiple biological effects. In addition, quinoa flour is increasingly used today because it increases the biological value of wheat bakery products by increasing the content of proteins, minerals and antioxidant compounds. Total flavonoids content and derivatives of dihydroxycinnamic acid of biscuits prepared with wheat (90%) and quinoa (10%) flour was investigated.

A difference was observed in the content of total flavonoids in wheat flour and quinoa flour (0.21±0.05 mg quercetin equivalents/g dry weight sample), whereby the presence of flavonoids was not registered in wheat flour extract. Statistically significant differences were observed in the content of dihydroxycinnamic derivatives in wheat flour (2.23±0.12 mg chlorogenic acid equivalents/g dry weight sample) and quinoa flour (3.60±0.01 mg chlorogenic acid equivalents/g dry weight sample). The presence of flavonoids was not registered in biscuit extracts. The reason for this can be a significant impact on the reduction of flavonoids of quinoa seeds after the baking process. The results indicated that the content of dihydroxycinnamic derivatives in the biscuit extracts (2.30±0.06 mg chlorogenic acid equivalents/g dry weight sample) was relatively close to the content in the flour used. This may be due to the relatively good thermal stability of these components. Namely, it is known that crosslinking of the cinnamoyl groups in the copolymers of dihydroxycinnamic acid affect the thermal stability.

The obtained results indicate a significantly different thermal stability of the tested components in the prepared biscuits.

Keywords: Flavonoids; Derivatives of dihydroxycinnamic acid; Biscuits; Wheat flour; Quinoa flour

Pešić, M. M., Milinčić, D. D., Kostić, A. Ž., Pešić, M. B., Stanojević, S. P. (2022).
Nutritional behavior and motives of college students for the food choice.

NUTRITIONAL BEHAVIOR AND MOTIVES OF COLLEGE STUDENTS FOR THE FOOD CHOICE

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The aim of this study was to investigate the motives behind food choices of Serbian college students. The choice of food is influenced by several factors which can be personal (e.g. knowledge, health status, specific habits and body weight), interpersonal and social determinants (e.g. religion, cultural norms) and ethical determinants (e.g. food produced/packaged according to ethical and environmental principles). Since most students leave their family homes during their studies, there is the question of what are the motives for their diet?

This research was conducted using anonymous online questionnaires. This research is a part of a broader study titled "Attitudes and behavior of students in relation to food and nutrition" conducted among students of the Faculty of Agriculture, University of Belgrade, on the subject of “Food Biochemistry“. The study sample included 200 students between the age of 20 and 23 (the average age was 21.18±1.3) and all were of Serbian nationality. The sample was composed of 136 females (68.0%) and 64 males (32.0%).

The majority of surveyed students are physically active (75%) and live with their families (57.0%), which can have a positive impact on their diet and a lower level of consumption of "fast food" (17.5%). Respondents have bad habits in terms of consuming cigarettes (65.0%), alcohol (73.0%) and energy drinks (75.0%). Most students consume all regular meals (73.0%). Based on the Body Mass Index (BMI) of respondents, they belong to the following categories: underweight (12%), normal weight (34%), pre-weight (17%), obese (37%); however, 55.0% believed to have "ideal weight". The reasons why they choose particular food are: it is not genetically modified, it tastes good, it is nutritious, it makes them happy, it was produced/packaged in an environmentally friendly and ethical way, while the price of food is not important to them. When buying food, respondents (59%) generally do not check the declaration on the product.

These results indicate the need to educate students about the harmfulness of cigarettes, alcoholic and energy drinks, the importance of BMI and declaration on the product.

Keywords: College students; Nutrition; Eating habits; Consumer behavior; Survey questionnaire

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DIASTASIS ACTIVITY OF CONVENTIONALLY AND ORGANICALLY PRODUCED HONEY

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The aim of this study was to determine whether there are differences in the values of the degree of diastase activity between honey produced in a conventional way and by applying organic production. Diastasis is a thermo-labile enzyme that breaks down starch and is used as an indicator of the quality and freshness of honey. Diastasis activity is related with changes in honey caused by heating or improper storage at high temperatures.

The diastatic activity of honey was determined by the spectrophotometric method according to Phadebas (with Phadebas tablets), in which the insoluble blue-colored cross-linked starch type is used as a substrate. This hydrolyzes the enzyme, yielding blue water-soluble fragments that are determined spectrophotometrically at 620 nm. The absorbance of the solution is directly proportional to the diastatic activity of the sample. Diastasis activity is expressed as the diastasis number (DN), which corresponds to the enzymatic activity of diastase in 1 g of honey, which can hydrolyze 0.01 g of starch in one hour at 40oC. Conventional and organic honey was used in the study: linden, acacia, chestnut and meadow.

According to the Rulebook on the quality of honey, honey products and other bee products ("Official Gazette Republic of Serbia" No.101/15) and the Codex Alimentarius standard, the activity of diastase in honey should be more than 8 DN. All analysed samples showed diastase activity higher than this value. Diastasis activity in the tested samples ranged from 8.40 to 29.50 DN. Organic linden honey (29.50 DN) had the highest diastase activity, while organic acacia honey (8.40 DN) had the lowest diastase activity. Samples of conventional honey had a higher diastase activity (18.30-29.20 DN) than samples of organic honey (8.40-16.30 DN) of the corresponding botanical species, except for organic linden honey (29.50 DN) which had a higher diastase activity than conventional honey of the same origin (17.20 DN). Samples of organic and conventional honey of the corresponding botanical species differed statistically in the degree of activity of the enzyme diastase.

The obtained results indicate that although most conventionally obtained samples have higher values of diastasis enzyme activity than samples produced in an organic way, such production methods are not crucial for the value of diastasis activity.

Keywords: Linden honey; Acacia honey; Chestnut honey; Meadow honey; Conventionally honey; Organically honey; Diastasis activity

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Bioactive peptides content and their activity of tofu-whey as waste in tofu processing.

BIOACTIVE PEPTIDES CONTENT AND THEIR ACTIVITY OF TOFU-WHEY AS WASTE IN TOFU PROCESSING

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The aim of this study was to assess the possibility of using tofu-whey as a functional additive in food production, which could potentially reduce the separation of organic waste in the tofu production process. In this way, the process of tofu production would be closer to the principles of „circular economy".

Tofu-whey is a pale-yellowish liquid with specific aroma/taste which remains as byproduct after tofu squeezing and represents an environmental problem for direct disposal. Tofu-whey is highly perishable due to its high water content and high content of nutritious substances for bacterial growth. Tofu-whey contains proteins, oligosaccharides, soluble salts and bioactive peptides. Understanding the activity of bioactive peptides of fresh tofu whey could be useful for application of tofu whey as a functional food additive. Tofu whey was obtained during tofu production from six soybean genotypes by hydrothermal processing in combination with chymosin-pepsin rennet.

The quality of soybean proteins is limited by soybean's high content of antinutritional factors including trypsin inhibitors and lectins. On the other hand, a balanced relationship between the content and activity of these biologically active components has a beneficial effect on human health (preventive and therapeutic effects in many diseases, such as diabetes, cardiovascular, bone and kidney diseases, and cancer). Moreover, because trypsin inhibitors are cysteine-rich proteins, heat treatment should aim to balance the content and activity of these physiologically active compounds (to preserve their content and reduce their activity) and to make them nutritionally valuable. Our results showed that applied heat treatment/high pressure/short time to soybeans was sufficient to get such a result in fresh tofu-whey. The trypsin inhibitor and lectin content in the samples was determined using SDS-PAG electrophoresis according to the Fling and Gregerson (1986) procedure, detailed by Stanojevic et al. (2011) and native PAG electrophoresis by Davis (1964). Trypsin inhibitory activity of fresh tofu whey was determined according to the method of Liu and Markakis 1986) using a crystalline bovine trypsin (Sigma, USA) and α-N-benzoyl-DL-argininep-nitroanilide hydrochloride (BAPA; Sigma, USA) as the substrate. Balanced content (9.76-13.33%) and activity (1.95-3.76%) of trypsin inhibitors and low lectins content (5.01-5.48%) indicate potentially good nutritional value of tofu-whey samples.

Tofu whey can be potential useful for application as a cheap, nutritional and functional food additive which certainly can to improve food-processing sustainability through recycling of waste.

Keywords: Tofu whey; Hydrothermal cooking; Chymosin-pepsin rennet; Trypsin inhibitors; Lectins

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CONSUMERS' PREFERENCE FOR LOCAL FOODS IN THE REGIONS OF CENTRAL MACEDONIA AND EASTERN MACEDONIA & THRACE IN GREECE

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Local Food Products (LFP) are in most cases Traditional Products (TP) with a growing impact on the local economies. Factors such as quality, freshness, and healthiness of these products as well as environmental footprint increase consumers' demand. The present research investigates consumers' preference for local food products in two Regional Authorities of mainland Greece (Central Macedonia and Eastern Macedonia and Thrace) with high agricultural activity and long culinary tradition.

A questionnaire survey of self-response was carried out in Fall 2021 on a sample of 611 participants through the Google platform. Variables such as sex, age, level of education, civil state, job situation, monthly income, region of origin and region of residence were analysed and compared among respondents who consume traditional products originating from the two localities under investigation. The obtained data were analysed using basic descriptive statistical tools combined with crosstabs and chi-square tests as well as Spearman's rho correlation test. The statistical processing of the data was performed using IBM SPSS Statistics for Windows (Version 25.0, IBM Corp. Armonk, NY, USA).

The results revealed that 20.1% of the participants consume regional TPs daily whereas 40.1% weekly. Moreover, another 37% of the participants consume those products with a frequency of 2-3 times per month (22.3%) and 2-3 times per year (14.7%). Finally, only 2.8% of the participants have never consumed traditional products from the two regions. It was observed that factors such as gender and level of education were not significantly associated ($p<0.05$) with the frequency of the consumption of TP from the two regions as suggested from the results obtained from chi-square test. The other factors such as age, civil state, job situation, region of origin, living region and monthly income were significantly associated with the frequency of consumption of TPs. It seems that more than 36% of the respondents, both male and females prefer to consume TP from the regions on a weekly base and more than 19.3% on a daily base. Among the respondents in the age group from 36-65 also more than 40.5%consume TP weekly and more than 22.3% daily. Moreover, 29.3% of the married respondents consume TP daily. The percentage of consumption of TP on a daily basis decrease in the following order depending on the job status; employed >unemployed> students. Moreover, increase in the monthly income increases the consumption of LFP on a daily base but for respondents, with a higher than 1500 Euro monthly income this trend is reversed. Additionally, pairwise comparisons of the region of residence revealed that preferences for LP of respondents living in Central Macedonia significantly differ from those of respondents living in the region of Eastern Macedonia and Thrace and of those living in other regions of Greece, with respondents living in Central Macedonia showing a higher preference for LFP. Moreover, it seems that respondents living in central Macedonia showed a higher preference for consuming LFP from the two regions on a daily and weekly basis compared to respondents with origin from other regions of Greece but their preference does not differ from that of respondents from Eastern Macedonia and Thrace. Respondents originating from Central Macedonia consume weekly more LFP than those from other regions of Greece but no difference was observed with those from Eastern Macedonia and Thrace. It seems that buying preference of responders for LFP has a stronger significant correlation with place of living compared to the place of origin.

Concluding, LFP from Central Macedonia and Eastern Macedonia and Thrace are recognized and consumed to a great extent but since this consumption is not associated with the level of education suggests the presence of a strong connection with the place and tradition. These findings provide important insight into the consumers' behaviour that could be used as a tool for the enforcement of the local economy in the studied regions.

Keywords: Local food products; Traditional products; Questionnaire survey; Consumption behaviour

Tunçer, E., Eşer-Durmaz, S., Keser, A. (2022).
Evaluation of individual lifestyle habits according to adherence to the mediterranean diet in Turkish adults: A cross-sectional study.

EVALUATION OF INDIVIDUAL LIFESTYLE HABITS ACCORDING TO ADHERENCE TO THE MEDITERRANEAN DIET IN TURKISH ADULTS: A CROSS-SECTIONAL STUDY

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The effects of the Mediterranean diet, which has proven a wide range of health benefits, in promoting a healthy lifestyle are remarkable. This study was aimed to evaluate some lifestyle habits according to the level of adherence to the Mediterranean diet in adults.

In this cross-sectional study, data were collected through an online survey (Google forms) between October 2020 and February 2021. The questionnaire was included demographic information (age, sex, education level, marital status), nutrition and lifestyle habits (meal consumption habits, smoking, alcohol, exercise, weight control), and the Turkish version of the Mediterranean Diet Adherence Screener (MEDAS). MEDAS consists of 14 items, and the score given for each item is 0 or 1. The total score of MEDAS ≥7 was considered moderate Mediterranean diet adherence, and ≥9 was considered good Mediterranean diet adherence. The study sample consisted of adults (aged 19-64) who approved the informed consent form and were recruited through the internet. Initially, 763 people were reached, a total of 173 people were excluded from the study (causes: chronic diseases, age, missing data), and ultimately the data of 590 participants (male: 127 (21.5%); female: 463 (78.5%)) were analyzed. The research data was evaluated using SPSS 26.0 program for Windows. The Pearson chi-square test was used to compare categorical variables. The statistical significance level was accepted as $p<0.05$. Ethics committee approval was received for this study from Kırıkkale University Non-Interventional Research Ethics Committee (Decision No: 2020.08.16).

The participants were constituted by young (mean age: 28.42±7.83 years). The majority of the participants were single (67.3%), and their education level was university (65.1%). The mean MEDAS score of the participants was 8.00±2.16; 43.6% had good adherence levels, 31.2% had moderate adherence levels, and 25.2% had low adherence levels. 61.7% of the participants in low adherence consumed two main meals a day, while 66.1% of the participants in good adherence level consumed three main meals a day ($\chi2$ =29.771; $p<0.001$). Skipping meals was more common in the low adherence group (79.9%) than in the moderate adherence group (64.7%) and good adherence group (59.5%) ($\chi2$ =17.750; $p<0.001$). The rate of skipping breakfast was higher in the low adherence group (36.1%) than in the good adherence group (20.3%) ($\chi2$=16.188; $p<0.05$). 87.6% of the participants consumed snacks. While the majority in the good (56.8%) and moderate (41.3%) adherence groups preferred fruit consumption as a snack, the majority in the low adherence group (46.9%) preferred packaged food products consumption ($\chi2$=81.061; $p<0.001$). There was no significant difference between the Mediterranean diet adherence groups regarding smoking and alcohol consumption ($p>0.05$). Regular exercise was higher among in moderate adherence group (23.4%) and the good adherence group (30%) compared to the low adherence group (10.7%) ($\chi2$=19.664; $p<0.05$). Regular weighing was more common among in moderate adherence group (62.0%) and good adherence group (65.8%) compared to the low adherence group (52.3%) ($\chi2$=7.208; $p<0.05$).

As a result of this study, it was seen that the Mediterranean diet model not only represents a healthy diet but also is an integrative part of healthy behaviors.

Keywords: Mediterranean diet; Lifestyle; Nutrition

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KNOWLEDGE AND CONSUMPTION OF ENDEMIC EDIBLE FLOWERS IN MEXICO

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Traditional Mexican cuisine has made use of endemic edible flowers in its dishes for centuries. Today, the Mexican edible flowers that have the most presence in traditional recipe books are the flowers of Squash (***Cucurbita spp.***), Mexican marigold (***Tagetes erecta L.***), Agave (***Agave spp.***), Yucca (***Yucca spp.***), Plumeria (***Plumeria rubra L.***), Dahlia (***Dahlia spp.***), Coral tree (***Erythrina americana***), and Funeral tree (***Quararibea funebris***). However, to our knowledge, there is currently no information on which of these flowers the population of Mexico really knows and consumes on a regular basis. For this reason, an online questionnaire was carried out with the objective of inquiring about the knowledge and consumption of Mexican edible flowers. In said questionnaire, the population of all the states of the Mexican Republic was considered, in an age range between 18 years and 60 years and above, of both sexes, of all educational and socio-economic levels, inhabitants of rural and urban areas, among other factors. Responses were obtained from 2,404 Mexicans, who responded, among other queries, to the following three questions: "From the following Mexican edible flowers, which ones do you know? Which ones did you already know were edible? And which ones have you consumed?"

According to the results of the questionnaire, some common patterns were found between the knowledge and consumption of different flowers, according to which three groups of Mexican edible flowers were identified. The first group was made up of the Squash blossom, which obtained a percentage of affirmative answers between 90 and 100% for the three questions posed. The foregoing indicates that practically all Mexicans know this flower, know that it is edible, and have also consumed it at some time in their lives. To the second group belonged the flowers of Agave, Yucca, Coral tree, and Funeral tree. These four flowers are less well known by Mexicans than the Squash blossom (between 25 and 50%), but, similarly to the Squash blossom, most Mexicans who know them know that they are edible (between 20 and 40%) and have consumed them (between 15 and 25%). In contrast to the first two groups, the third group showed a different pattern of knowledge and consumption. The flowers of Mexican marigold, Dahlia, and Plumeria, belonging to this group, are known by more people than the flowers belonging to the second group (between 30 and 80%). However, most of the people do not know that these flowers are edible (between 10 and 45%) and have not consumed them (between 5 and 25%).

Based on the results reported, it is easy to affirm that the Squash blossom is the best known edible flower that is consumed nationally in Mexico. This fact coincides with the high popularity of this flower in other countries of the world, such as Italy, Greece, Turkey, and Vietnam. The high popularity of the Squash blossom could be related to the cultivation of the fruit of the Squash plant, which facilitates its consumption and availability throughout the year. This is in contrast with the plants of Agave, Yucca, Coral tree, and Funeral tree, which do not bear fruit and whose flowers are consumed seasonally, obtained by gathering and not by cultivation. Beyond this, Mexican recipes for Squash blossoms show influence from French cuisine, while the recipes made with the other flowers are typically more local. The differences in knowledge and consumption patterns observed between these flowers and those of Mexican marigold, Dahlia, and Plumeria are probably due to the fact that the latter are mainly used in Mexico as ornamental flowers. In conclusion, of the Mexican edible flowers studied in this work, the only flower whose knowledge and consumption seems to permeate all strata of Mexican society is the Squash blossom, also well established internationally as an edible flower. These results highlight the potential of the Mexican edible flowers evaluated in this work to be incorporated into a greater number of dishes, with the aim of making them known to the Mexican population and encouraging their consumption.

Keywords: Mexican edible flowers; Mexican cuisine; Squash blossom; Agave flower; Yucca flower

Zampouni, K., Sideris, N., Tsavdaris, E., Katsanidis, E. (2022).
Structural and physical studies of olive oil and coconut oil oleogels as animal fat alternatives.

STRUCTURAL AND PHYSICAL STUDIES OF OLIVE OIL AND COCONUT OIL OLEOGELS AS ANIMAL FAT ALTERNATIVES

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Edible oleogels are defined as semisolid systems comprising of a liquid oil phase, structured with one or more lipophilic structurants. Oil is physically entrapped in a structured network, leading to the formation of a gel. The type of the formed network depends on solvent polarity and characteristics. Olive oil is a functional food containing several bioactive components besides having a high content of monounsaturated fatty acids. Coconut oil mainly consists of medium-chain fatty acid triglycerides, considered to protect against heart disease. Monoglycerides can be used as oleogelators, providing similar properties to the colloidal crystalline network of triglycerides and creating oleogels with mechanical properties similar to saturated fat. Edible oleogels could be used to replace saturated fats and add value to meat, dairy, or dough products.

The objective of the study was to understand the effect of the ratio of coconut and olive oil blends, structured with 10% w/w monoglycerides (MGs), on the structural and physical properties of the formed oleogels. The effect of oil type on oleogel mechanical properties (hardness, gel strength) was studied by texture analysis, while the microstructure was investigated by polarized light microscopy. Additionally, the melting point and instrumental colour parameters of the oleogels were determined.

According to the study's findings, the oil phase composition influences the microstructural features of MGs crystals. Increasing olive/coconut oil ratio led to a slight increase in the melting point of the system. Higher hardness and gel strength values were noted for coconut oleogels, while the addition of olive oil resulted in weaker textural properties. The increase in the olive oil ratio altered the colour parameters, decreasing the L* and increasing the b* values.

In conclusion, monoglycerides can structure olive oil, coconut oil, and blends of the two oils, but the type of oil affects both the structural characteristics (i.e. crystalline structure) and the properties of the formed oleogels. Based on their structural properties, olive/coconut oil oleogels could be incorporated into various food systems, allowing for the substitution of animal fat and reducing saturated and trans fat.

Keywords: Olive oil; Coconut oil; Edible oleogels; Monoglycerides; Fat replacement

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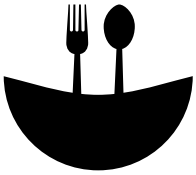
Baptista, A., Costa, V. (2022).
Replacing meat with cultured meat, are we there yet?.



REPLACING MEAT WITH CULTURED MEAT, ARE WE THERE YET?

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Population is continuously growing, the Food and Agriculture Association (FAO) concluded that a 70% increase in food production would be necessary to feed the expected world population by 2050 (9.7 billion). An alternative to address this issue could be using cultured meat as an emergent protein alternative.
This review aims to compile the state of the art of cultured meat, focusing on how to address pressing issues such as nutritional composition, health, environment, food safety and the identification of potential limitations intrinsic to the growth of meat in laboratories.

A comprehensive literature review was undertaken using the Pubmed, Web of Science and Google Scholar databases by applying the filters "*cultured meat*" and "*in vitro* meat", resulting in a final number of 40 articles. Conventional meat production - by slaughtering livestock - is known to have a significant environmental impact, by the exacerbated use of land and water, and greenhouse gas (GHG) emissions. In addition, meat consumption may be associated with emergent food-borne diseases and the development of antibiotic-resistant microorganisms.

In vitro meat production has a favourable impact on animal welfare by not having to sacrifice the animal. Since cultured meat comes from replicating animal cells, it is expected that the final product will be nutritionally similar to conventional meat. Nevertheless, the impact of this product on human health is still unknown and further investigation is needed. In terms of food safety, several studies suggest that cultured meat is safer than conventional meat because it is prepared in a sterile, replicable, and fully controllable environment. Some groups argue, that there is a potential for genetic instability due to the high cell proliferation rate and consequent potential cancerous profile.

So far there has been no consensus on the environmental benefits of cultured meat production. However, a recent study, reported that the use of a sustainable energy system in cultured meat production could compete ecologically and environmentally by reducing the ecological footprint, compared to conventional meat production and other protein alternatives, in less than 10 years.

To establish lab-grown meat production as a viable alternative to conventional meat, it is necessary to develop scalability of the production process; reduce production costs; ensure microbiological safety of cultured cells; ensure a sterile culture environment; and mimic the sensory aspects of conventional meat, such as texture, taste and smell.

In conclusion, cultured meat can be a tangible protein alternative that could mitigate sustainability and food safety concerns, however more studies are needed to confirm the nutritional composition and evaluate its impacts on health.

Keywords: Cultured meat; *In vitro* meat; Livestock farming; Health; Nutritional composition; Environmental impact; Consumer perception

Lima, M. J. R. (2022).
Are there any risks associated with a vegetarian diet in children?.

ARE THERE ANY RISKS ASSOCIATED WITH A VEGETARIAN DIET IN CHILDREN?

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Vegetarians do not consume any food that involves the killing of an animal such as meat, poultry, fish, shellfish, or even insects.

The majority of parents may wonder if kids can assume a vegetarian diet and still get all the nutrition they need to grow up healthy and strong. Literature evidences that a well-planned vegetarian diet can be a healthy way to eat, in any part of the life cycle, including children.

Today, we also know that reducing the excessive consumption of animal protein (especially meat) and replacing it with meals with plant-based proteins is one of the recommendations for fighting global warming, climate change and become more sustainable. Usually this decision is made early, by their parents, that decide to become vegetarians and assume that this is a familiar decision, because of their concern for animals, for the environment and for their own health.

There are different kinds of vegetarian diets: the lacto-vegetarian, the ovo-vegetarian and finally the vegan diet. The production of vegetarian meals using local and regional vegetables does not mean increased costs or the need to purchase new technical equipment or the use different cooking methods; it is possible to adapt traditional Portuguese dishes and transform them into vegetarian options, with controlled costs and adequate nutritional composition.

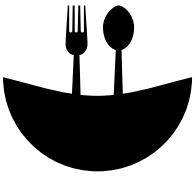
Caregivers of children who practice a vegetarian diet should present particular attention to the consumption of calcium, zinc, iron, iodine, and essential fatty acids, as well as vitamin B12 and dietary practices that enhance the absorption of zinc and iron. Vitamin B12 can be found in dairy products, eggs, and vitamin-fortified products, such as cereals, breads, and milk alternatives, and nutritional yeast; vitamin D is present in milk; calcium can be found in dark green leafy vegetables; broccoli; dried beans and cereals; protein exists in in dairy products, eggs, dried beans; and iron is present in eggs, dried beans, dried fruits, whole grains, leafy green vegetables, and zinc may be present in cooked soy beans, nuts and almonds.

In the first 6 months of life the main sources of protein and nutrients for infants are breast milk and formula (soy formula for vegan infants). Vitamin D recommendations are the same for vegetarian and non-vegetarian kids. The Guidelines for the introduction of solid foods are the same for vegetarian and non-vegetarian infants. After a child starts eating solids, protein-rich vegetarian foods can include tofu, soy yogurt, cottage cheese and legumes (such as beans, chickpeas, and lentils).

The positive results accumulating for adults are encouraging for exploring the vegetarian meals for children. However, an interesting approach may be “flexitarianism” that consists in a plant-based diet, with small amounts of meat and dairy included.

However, appropriate caloric intake should be ensured and monitored by parents, nutritionists and pediatricians, in order to screen for eating disorders.

Keywords: Vegetarian diets; Child; Sustainable



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INFLUENCE OF STORAGE TIME AND FORMULATION ON THE ACCEPTABILITY OF "TORTILLAS" MADE WITH WHEAT AND AMARANTH FLOUR

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In recent years, many factors have influenced the dietary habits of the Argentine population had change unfavorably. Current labor demands, stress, the global crisis, the limitation of available time as well as the incorporation of women into the labor market, are some of the causes that generate those changes. In 2013 at the Argentine Congress of Nutrition, was concluded that the argentine diet is monotonous, with few healthy habits and childhood obesity is increasing. One of the possibilities available in this case is to add a healthy ingredient in baked goods that are highly consumed in this country, in such a way as increase the nutritional value of a mass consumption product. The amaranth grain, as well as quinoa, is considered a pseudo-cereal, because it has properties similar to those of cereals, but botanically it is not. Although, in general, it is associated with this group. Amaranth protein is of excellent quality dew to it has an almost perfect balance of aminoacids to form protein, being superior to that offered by the proteinaceous content of milk. It has abundant lysine, which is the scarcest amino acid in other cereals such as corn, rice and wheat, consequently, by combining some amaranth with these, the excess lysine complements the protein of the other cereals, allowing elements to be assimilated that due to lack of lysine would have been discarded, achieving a significant improvement in nutrition. The objective of this work was to evaluate the acceptability by consumers in Buenos Aires, of “tortillas” made with wheat flour and “tortillas” fortified with amaranth flour, stored for four different times. Due to the demand for baked products with healthy added value, in this work a formulation of a new baked product was made, a wheat flour “tortilla” with the addition of 12% Amaranth flour, produced on an industrial scale. The manufacture of the precooked “tortillas” was carried out in a bakery company in Buenos Aires, Argentina, using the bakery formulation, which is a formula that, contrary to the idea of expressing the percentages based on the total volume (or weight), is made based on the weight of flour used, which is taken as 100. The “tortilla” treatments corresponded to: Treatment 1 (T1) (100% wheat flour) and Treatment 2 (T2) “tortillas” with 86% wheat flour and 14% amaranth flour). The “tortillas” were stored at a temperature of 20ºC for four different times (10, 20, 27 and 35 days), with time number 3 being the established commercial shelf life (27 days). The time 4 (35 days), corresponds to 10 days after the expiration date, which is selected to evaluate the behavior of the shelf life. All samples had the same day of preparation and were frozen at each established time. A total of 8 samples were analyzed (2 treatments x 4 storage times), which were presented in small triangular-shaped portions, each filled with mozzarella cheese. They were coded with a random three-digit number, evaluated at a temperature of approximately 20/24 ˚C, in a sequential monadic display and statistically balanced in their presentation. Acceptability was determined with a structured scale of 7 points, as well as global assessment and purchase intention of the two types of tortillas in the four times of shelf life. Data were statistically analyzed with SAS software, using procedure GLM and Tukey's test for mean difference (α: 0.05). For the treatments according to each time, the acceptability values were the following: (T.1 (wheat) 4.8; 4.69; 4.68 and 4.46 and T2 (wheat + amaranth) 4.84; 4.54; 4.74 and 4.63), no significant differences were observed (p>0.05). In terms of acceptability, global assessment and purchase intention, there were no significant differences between both treatments or during storage time (p>0.05). The sensory characteristics of the two treatments were not accepted differently and neither were they on day 35 of storage were negatively influenced by time, therefore, an extension of the commercial shelf life can be considered. As a conclusion, when observing that the acceptability of the tortillas was not affected by the storage time or by the inclusion of an alternative flour (which is not common to the palate of argentine consumers), a door is opened to the possibility of addition of this cereal to the diet of the argentines, who would not reject the product, and in this way, a variety of vitamins and minerals typical of this cereal could be incorporated and that could improve the health of the human organism.

Keywords: Sensory analysis; Consumers; Alternatives flours

CHESTNUT PROCESSING INFLUENCES CHESTNUTS SENSORY PROFILE AND ACCEPTABILITY

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Nowadays, consumers are demanding more from the characteristics and flavor of the products. The impact of each product's sensory attributes on our daily consumption requires the development of reliable analytical methods to select products with a good balance between quality and sensory profile. Chestnut (*Castanea sativa*) is a fruit with unique sensory characteristics that can be used in several gastronomic dishes, from desserts to main courses. Sensory evaluation of chestnuts, raw, roasted, or boiled, is crucial for developing and improving gastronomic production steps.

In the present study, we identify the main chestnut sensory attributes, using a sensory panel, of two chestnut varieties – Longal and Judia – prepared and presented to the tasters in three different ways: raw, roasted, and boiled.

The study was conducted in two stages. First, the Flash Profile (FP) method was used. In this evaluation, each panel member described, freely, the attributes of the different chestnut samples at visual, olfactory, and taste levels. Subsequently, fifty-one sensory terms were selected for a second sensory analysis using the Check-All-That-Apply test (CATA test) method.

Regardless of the type of preparation and variety, the typical sweet taste, intense and rich flavor of chestnuts were common in all the samples. Hardness, crunchiness, and compactness were more perceptible in the roasted and raw preparations.

The two varieties share several common sensory attributes, and the sensory differences are more visible between the different preparations, regardless of the variety. Among the attributes described by the panel, sweetness and texture are, probably, the most appreciated attributes by the chestnut consumer.

Keywords: *Castanea sativa*; Sensory panel; Flash Profile, CATA test

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EVALUATION OF EMOTIONAL EATING PROFILE IN A SAMPLE OF ROMANIAN ADULTS

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Background: Concern about food choices based on emotional eating that may have adverse effects on health (like obesity, cardiovascular diseases or cancer) is currently at the forefront of public health experts worldwide. This is a descriptive cross-sectional questionnaire-based study, carried out in 2018, aiming to evaluate emotional eating profile in a Romanian sample population of 674 participants.

Materials and Methods: The questionnaire was developed and validated within the EATMOT project Project PROJ/CI&DETS/2016/0008 from Polytechnic Institute of Viseu, Portugal, and then it was translated into Romanian language. The analyzed parameters were age, gender, residency, weight, height, or current employee status. The questions referred to emotional eating were, as follows: Q1.Food helps me cope with stress, Q4. I often consume foods that helps me relax, Q5. Food makes me feel good, Q6. When I feel lonely, I console myself by eating, Q8. For me, food serves as an emotional consolation, and Q9. I have more cravings for sweets when I am depressed. Possibilities of answering all nine questions were totally disagree, disagree, neither agree nor disagree, agree, or totally agree. We created two composite scales, block 1 investigating food as an escape (Q1, Q6, Q8 and Q9), block 2 investigating food associated with well-being (Q4 and Q5).

Results: The elderly agreed predominantly to questions that investigated food as an escape. Young adults and the elderly responded in agreement and in full agreement with the diet associated with well-being. The elderly were most interested in choosing the right diet for weight control. Adults in the 30-59 age group were mostly interested in eating stimulating foods. The men answered mostly in agreement and totally agreed to the questions in block 1 and block 2. We obtained very close percentages to answers 4 and 5 in women and men. We did not obtain differences between the answers to the questions depending on the residency of origin. BMI was significantly higher in those who answered agree and totally agree to the questions in block 1. We did not obtain a significant association between BMI and the answers to the questions in block 2 and question about eating food to control weight.

Conclusion: The EATMOT questionnaire was used to better assess of the determinants for food choice in Romania, and to plan more efficient strategies to improve healthy eating patterns, diminishing the burden of chronic diseases, especially obesity.

Keywords: Emotional eating; Healthy diet; Social influences; Obesity prevention

Djordjević, M., Djordjević, M., Šoronja-Simović, D., Šereš, Z., Tukuljac, L. P. (2022).
Big opportunities for tiny seeds: Mineral composition, protein content and sensory properties of gluten-free bread enriched with non-germinated and germinated alfalfa seeds.

BIG OPPORTUNITIES FOR TINY SEEDS: MINERAL COMPOSITION, PROTEIN CONTENT AND SENSORY PROPERTIES OF GLUTEN-FREE BREAD ENRICHED WITH NON-GERMINATED AND GERMINATED ALFALFA SEEDS

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Greater consumer demands for nutritious and healthy foods matching today's lifestyle requirements are the driving force for the development of innovative ingredients with versatile functionalities. This task becomes even more important when it comes to the part of the population with coeliac disease (CD) whose diet is characterised by high input of fat and carbohydrates but low input of dietary fibres, minerals (Ca, Mg, Fe, Zn) and vitamins. Corresponding nutrient deficiencies can further lead to the development of other related diseases compromising the overall well-being of CD patients. Furthermore, other conditions linked to gluten ingestion and a great number of individuals embracing the gluten-free diet as a healthier choice are other reasons for addressing this global challenge.

High nutritional value (rich in proteins, dietary fibres, essential polyunsaturated fatty acids, minerals, vitamins and associated total phenols), absence of gluten, extensive cultivation and availability make lucerne (Medicago sativa L.) or alfalfa seeds an ideal candidate for application in gluten-free bread (GFB) production. However, the presence of antinutrients and beany flavour could limit its use. To tackle these limitations, germination as a natural processing technique is successfully employed enabling also improvements in digestibility of starch and proteins and bioavailability of the other nutrients and bioactive compounds. Considering the presented background, this study aims to explore the effect of non-germinated and germinated alfalfa seeds flour addition (5% on maize flour/starch basis) on GFB mineral composition, protein content and sensory properties (specific volume, external appearance, crumb appearance, smell and taste). Additionally, the aforementioned properties of GFB containing alfalfa were compared with control (without alfalfa) and commercial GFB available on the market.

In GFB containing alfalfa significant increase in Mg (from 342.2 to 908.3 mg/kg), K (from 968.8 to 1478.9 mg/kg) and Zn (from 10.8 to 21.1 mg/kg) content was observed when compared to commercial GFB. However, corresponding bread samples showed lower content of Ca and Fe compared to commercial GFB, but Fe content in GFB containing alfalfa was still higher than in control. Protein content ranged between 4.7 and 6.0 % db and it was higher in GFB containing alfalfa. Control GFB received the highest scores upon sensory evaluation followed by GFB containing germinated and non-germinated alfalfa. Despite the observed volume depressing effect, GFB with alfalfa were characterised by fine taste, soft crumb texture with medium size air pores of good uniformity.

Keywords: Gluten-free bread; Germination; Alfalfa; Minerals; Sensory evaluation

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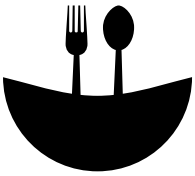

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Paço, T. A., Arsénio, P., Costa, F. P., Raymundo, A., Prista, C., Magalhães, A., Espírito-Santo, D. (2022). The wild food rooftop - Traditional edible plants in a green roof of Lisbon area.

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THE WILD FOOD ROOFTOP - TRADITIONAL EDIBLE PLANTS IN A GREEN ROOF OF LISBON AREA

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Rooftops microclimate is harsher for plants in comparison with the conditions found at ground level for the same local, with greater exposure to radiation and wind, more so in climates with dry, hot summers. Under such climates, wild plants may be an interesting solution to use in green roofs, as a way of increasing agricultural production in urban environments. The Rroofood project (https://tapaco4.wixsite.com/rroofood) is currently evaluating wild edible plants that were traditionally used in the central and southern areas of Portugal, for urban farming in green roofs of the Lisbon area. The aim of the project is to find enhanced sustainable production solutions for urban agriculture in green roofs, using these particular kind of plant species. Innovative food products, based on such plant material, are currently under development.

A green roof was built at Instituto Superior de Agronomia campus to host the collection of plant species. These were selected according to three criteria: i) plants currently or historically used in traditional gastronomy, ii) plants from areas with environmental conditions of equal or greater demand than the Lisbon area, iii) species with resilience traits. A database was developed and fifteen species were selected among 70 for sowing in the green roof. These species belong to the following genera: Amaranthus, Beta, Cakile, Chenopodium, Chrysanthemum, Nigella, Papaver, Petroselinum, Rumex, Scolymus, Tragopogon, and Viola . Each species was seeded in a 1 × 1 m2 area of the green roof, in three equidistant lines of 0.5 m length, with N-S orientation, except for Tragopogon and Viola, given the small quantity of seed available of these two species, which were seeded in half proportional areas and lengths. The total sowing area is a 7 x 2 m2 plot, with 15 cm deep green roof technical substrate, placed above filter, drainage and protection layers, displayed over the roof surface, and contained with concrete blocks. Plant material is currently under analysis for nutritional composition in order to determine the most adequate gastronomic preparations.

Germination and development of plants was successful, except for the genera Tragopogon, Rumex and Viola. The species Nigella damascena and Chysanthemum coronarium reseeded naturally, providing evidence of this interesting feature. Another group of species (Beta vulgar ssp. maritima, Scolymus hispanicus, Petroselinum crispum and Cakile marítima ssp. integrifolia) was still present on the roof in the next spring. Following a first gastronomic evaluation, a selection of five species (Amaranthus album, Amaranthus blitoides, Chysanthemum coronarium, Nigella damascena and Rumex crispus) was sowed again, yielding a total of nine actually present in the green roof, with potentially interesting features for further work, combining plant physiology traits and gastronomic aptitude.

Keywords: Nature-based solutions; Urban farming; Gastronomy

TORTAS DE NANDUFE: CHARACTERIZATION OF A TRADITIONAL AND APPRECIATED PRODUCT

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Tortas de Nandufe were created many years ago and did not appear by chance, but rather as an attempt by the bakers of the locality of Nandufe to diversify their production. This is a dry, long, and crooked cake that combine a mixture of the properties of bread and cake. They are produced in an artisanal way and baked in wood ovens throughout the year. Currently, they are sold in traditional commerce, in the fairs of the region, in the festivals and on pilgrimages. This is a unique, unmistakable, and much sought-after product. The ingredients used to produce these pies are wheat flour, salt, eggs, sugar, yeast, water and they do not contain any additives or preservatives.

The aim of this work is the physical and chemical characterization of 3 samples of Tortas de Nandufe from different manufacturers and to verify if there are differences between them. To this end, the following physicochemical parameters were evaluated: colour, texture, honeycomb characteristics, water activity (aw), moisture, protein, fat, fibre, ash, and non-nitrogenous extractives contents.

The results of the different samples were similar for moisture (35.8-37.6%), protein (9.4-10.4%) and fibre (0.86-0.88%) contents, and for aw (0.87). For the remaining evaluated characteristics, the Tortas presented different values, showing that the samples are not similar. This conclusion may result in a different sensory appreciation by consumers, which may determine their choices when purchasing this type of product.

Keywords: Traditional product; Tortas of Nandufe; Physical properties; Chemical characteristics

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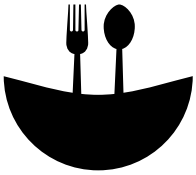
Baris, B., Ilcus, T., Uzun, C., Fazakas, Z., Tarcea, M. (2022).
Integrative nutrition in cervical cancer based on the program of prevention, screening and treatment of cervical cancer in Romania.



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INTEGRATIVE NUTRITION IN CERVICAL CANCER BASED ON THE PROGRAM OF PREVENTION, SCREENING AND TREATMENT OF CERVICAL CANCER IN ROMANIA

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Nutrition can affect a person's life on multiple levels, especially after a cancer diagnosis. We concentrated in this study upon three of these aspects associated with integrative nutrition: physical, social and mind-body comfort to ensure optimal health and healing in cervical cancer.

A stepwise approach was developed, to help the cancer patients through lifestyle changes by focusing on nutrition and well-being. Recent international and Romanian literature was evaluated and used for developing a management plan for Romanian cervical cancer patients, in the context of the project entitled “Program of prevention, early screening, diagnosis and early treatment of cervical cancer – Romania Center Region”, POCU/826/4/9/138603, code project SMIS 138603, which started in November 2020 and is lasting until December 2023. 170.200 women are estimated to participate in the screening program, and we gather our data based on a part of this total sample.

Physical health can be achieved by reducing malnutrition and chronic inflammation in cancer patients, starting by introducing the patient to the general aspects of anti-inflammatory nutrition based on personalized diet, along with hydration, detoxification and cleansing of the digestive system. To make the diet as maintainable as possible it is important to increase the overall standard of living by consuming organic fruits, vegetables and nuts, also keeping up a healthy social life by integrating new dietary habits and encouraging the patient to have regular meals and enjoy it with relatives or friends. Emotional and social health was also included in our integrative management program, based on cultural and environmental community profiles. Cervical cancer patients can benefit from dietary and lifestyle changes by adapting to an integrative nutrition program which focuses on healthier meals, stronger connections of mind-body attitudes, and sustainable social relationships.

Including integrative nutrition in the patient’s life is an ongoing experimental approach and we are looking forward receiving feedback if the women can report an increase in their life quality.

Keywords: Integrative nutrition; Cervical cancer; Inflammation; Healthy diet

Curutchet, A., Serantes, M., Pontet, C., Prisco, F., Barg, G., Miguez, M., Menéndez, J. A., Arcia, P. (2022).
Consumers' response to different food categories enriched with brewer's spent grain, sustainability information effect.

CONSUMERS' RESPONSE TO DIFFERENT FOOD CATEGORIES ENRICHED WITH BREWER'S SPENT GRAIN, SUSTAINABILITY INFORMATION EFFECT

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Brewer's spent grain (BSG) has been commonly considered as only a waste product, but recent research in its composition has shown that it can be a functional ingredient. The high amount of fibre in BSG justifies its use as a functional ingredient in the preparation of food for human consumption. Fibre consumption has potential benefits to human health such as preventing chronic non-communicable diseases including obesity, diabetes and cardiovascular disease. The aim of this study was to evaluate the impact of adding BSG to bread (8.3%), pasta (2.8%), and chocolate milk (0.35%) on acceptability and purchase intention. The amount of BSG flour used in each product was adjusted to reach a total fibre content high enough for the products to bear the "Source of fibre" claim according to Uruguayan law and comply with Codex Alimentarius source of fibre claim. A key objective was to assess the effect of extrinsic information about BSG's sustainability and nutritional appellations on consumers' response. Three categorical two-level factors of the product labels were studied: sustainability logo, brief description of BSG benefits to both consumers' and environment and BSG appellation. Thus, this resulted in 8 different labels for each product which were analyzed through eye-tracking technology by defining the areas of interest (AOI) on them. Thirty consumers were presented with the labels for each product in random order for 5 seconds (Task I), and again for an unlimited period followed by a question regarding purchase intention or acceptability (Task 2). Gaze duration in AOIs, time to first view in each AOI, and total gaze duration in the whole label were measured for both tasks. The best consumers' response occurred when the label displayed: sustainability logo, fibre source claim and BSG description. The phrase "Malted Barley" as an appellation of BSG was also analyzed, although it did not produce a significant effect on consumers' attention. Additionally, consumers' response to fibre-enriched products and regular products, under blind and informed condition, were assayed through sensory evaluations. Over one hundred consumers participated in each session for every product, where both regular and fibre-enriched samples were evaluated. Evaluation consisted of completing a "Check all that apply" (CATA) questionnaire, an overall acceptability rating, and a purchase intention ranking. While no information was given for the blind condition, the selected labels from the eye-tracking study were displayed for the informed condition. Results showed that, under blind conditions, pasta samples did not show a significant difference in acceptability nor purchase intention; while BSG-added bread and chocolate milk scored significantly lower than the regular samples. According to CATA questionnaire, BSG addition introduced unacceptable changes in the sensory features of all three products, although these were less perceivable by consumers when information was provided. Differences in acceptability between fibre-enriched and regular products positively increased with the provision of information. Under informed conditions, consumers expressed a significant preference in terms of overall liking for the fibre-enriched pasta compared to the regular one. For bread and chocolate milk, no significant difference was found in acceptability between the regular and fibre-enriched samples. BSG-enriched products were accepted as much as the regular ones when information was provided, confirming the importance of information (source of dietary fibre and sustainability claims). Eye-tracking experiments demonstrated that when BSG description and sustainability logo were included on the labels, they were perceived by the consumers, and these caused a positive effect in their purchase intention of all three products. The terms used for BSG appellations in this study does not seem to be important or did not attract the attention of consumers in any of the three products. Eye-tracking technology proved to be a powerful tool to understand which aspects consumers pay more attention to on labels. Knowing and using the information that causes a positive effect on product perception when presenting the products to consumers may be a suitable strategy to increase the purchase intention of BSG-enriched products.

Keywords: Eye-tracking; By-products; Sustainability; Food labels; Fibre enrichment

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(pp. 84-84)

FRUIT AND VEGETABLE CONSUMPTION IN SCHOOL-AGED CHILDREN: INFLUENCED BY FREQUENCY, VARIETY OR PREFERENCES?

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Worldwide, a large proportion of children consume suboptimal amounts of fruit and vegetables. In response, numerous intervention studies have been conducted to promote fruit and vegetable consumption. To increase the effectiveness of the intervention, it is necessary to identify the factors that most influence children's fruit and vegetable consumption in their socio-cultural environment. Indeed, according to Bronfenbrenner's bioecological model of human development, many factors (preferences, education, family, peers, school environment, availability of food, etc.) can influence children's fruit and vegetable consumption, with availability and preferences appearing to be the most prominent. Therefore, the aim of this study was to investigate whether the consumption of fruit and vegetables is related to the following factors: (1) children's preferences, (2) frequency of consumption, and (3) variety of fruit and vegetables among primary school children in Croatia.

The study involved 195 (52.3% boys) school-aged children (8.9 ± 0.5 years) from 14 primary schools in the city of Zagreb. Dietary records for three non-consecutive days were used to estimate fruit and vegetable intake, frequency of fruit and vegetable servings, fruit and vegetable variety score, and food variety score. The food variety score was calculated as the average number of different food items eaten by each child during the recording of the 3-day dietary records. The fruit and vegetable variety score was calculated as the total variety score for fruit and vegetables only. Children's preference for fruit (26 species) and vegetables (28 species) was determined using a questionnaire that included a 5-point hedonic scale, where 1 meant 'I dislike it a lot' and 5 meant 'I like it a lot'.

Children consumed an average of 304.0 g (198.9 - 412.4 g) of fruit and vegetables daily. Only 28.2% of the children met the World Health Organization recommendations for daily consumption of 400 g of fruit and vegetables. The calculated value for fruit and vegetable variety score shows that children consumed average 3.3 (2.7 - 4.0) different fruit and vegetables daily, which is on average 24% (19 - 28%) of the food variety score. The amount of fruit and vegetables consumed was positively correlated with the fruit and vegetable variety score ($r = 0.567$; $p < 0.001$) and the proportion of the fruit and vegetable variety score to the food variety score ($r = 0.621$; $p < 0.001$). In terms of frequency of consumption, children consumed fruit and vegetables on average 4.7 (3.7 - 6.3) times per day. The daily frequency of fruit and vegetable consumption was positively correlated with the amount of fruit and vegetables consumed ($r = 0.518$; $p < 0.001$). Overall, the children rated 54 different fruit and vegetables with an average score of 3.3 (2.6 - 3.8). According to Spearman's rank correlation coefficient, the amount of fruit and vegetables consumed was not related to the children's fruit and vegetable preferences ($r = 0.130$; $p = 0.069$).

In conclusion, most school-aged children do not consume enough fruit and vegetables on a daily basis and a strategy needs to be developed to increase children's intake of fruit and vegetables in children. The results of this study highlight the importance of frequency and variety of fruit and vegetable consumption in explaining fruit and vegetable consumption among primary school children. As frequency and variety of consumption appears to be a more important factor than preferences for higher fruit and vegetable consumption, an effective strategy to promote fruit and vegetable consumption among primary school children in Croatia could be to include more fruits and vegetables in school meals and meals prepared at home.

Keywords: Childhood; Frequency; Fruit intake; Preference; Variety; Vegetable intake

Fontana, F. D. D., Armada, M., Goldner, M. C. (2022).
Comparison of asynchronous and synchronous modes to analyse consumer insights about food consistency. Free word association test in virtual context.

COMPARISON OF ASYNCHRONOUS AND SYNCHRONOUS MODES TO ANALYSE CONSUMER INSIGHTS ABOUT FOOD CONSISTENCY. FREE WORD ASSOCIATION TEST IN VIRTUAL CONTEXT

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Free word association (FWA) is a projective technique in consumer science to analyse associations that first arise on mind, which might be relevant to know consumer food preferences. The Cognitive Salience Index (CSI) takes values between 0 and 1. In a list of several things, the first and most frequently mentioned words will have a higher CSI. In consumer science, this index allows to obtain insights related to food preferences and purchase. Although confinement has hindered the communication with consumers in sensory and consumer science, new virtual modalities are promising to contact them. On the other hand, in Latin America the word "consistency" is commonly related to food texture by consumers, but it is not applied as a sensory descriptor. For this purpose, the aim of this study was to analyse and compare the associations about food consistency with two virtual modalities. A quanti-qualitative study was performed on 238 consumers. 137 answered an online self-administered survey made with Google forms (asynchronous mode) and 101 answered the same survey but in an online interview by videoconference (synchronous mode). In both surveys consumers had to express the first 3 associations that come to their minds when the stimulus "food consistency", "consistent food", "very consistent food" and "bit consistent food" was read. The responses were analysed by data triangulation and grouped in categories according to their similarities. The mention frequencies of each category were calculated. Contingency tables were built, and the percentages of each category mention for each virtual mode (synchronous/asynchronous) were calculated. The Chi2-test was used to study the association between the virtual method and the term category. Z-test was used to compare proportions. For categories in common between different stimulus and virtual modes CSIs were computed. The differences in the CSIs were analysed by ANOVA considering virtual modes and categories as fixed effects and its double interaction. When significant interactions were found, partitioned ANOVA was performed. The Tukey test was applied to compare means. Data analysis was performed with R (v. 4.1.2), InfoStat (v. 2020p) and SPSS (v. 25) and a 5% significant level was considered.

2856 terms were elicited which were grouped in 33 different categories for "food consistency", 36 for "consistent food", 34 for "very consistent food" and 36 for "bit consistent food". "Physical status" (15%), "soft" (10%), "tactile texture" (10%), "hardness" (9.5%) and "general texture" (7.3%) were the most mentioned categories for "food consistency"; "solid food" (13%), "hardness" (10%), "soft food" (8.1%), "firmness" (8.1 %) and "semisolid food" (7.4%) for "consistent food"; "solid food" (21.6%), "hardness" (12.9%), "soft food" (5.3%), "force/resistance" (5.3%) and "appearance and visual texture" (4.9%) for "very consistent food"; "semisolid food" (12.9%), "liquid food/drinks" (12.2%), "physical status" (11.5%), "soft" (8.4%) and "appearance and visual texture" (6.9%) for "bit consistent food". When comparing both virtual modes of survey, the frequency of mention was significantly different ($p<0.05$) for the following categories: "semisolid food, solid food, soft, quantity, water content, hardness, fluffiness/foam, fluency, special population, hedonic, chewing/digestion, health and nutrition, physical-chemical parameter, flavour, satiety, general texture, time/shelf life" (all Chi2>3.862, df=1).

Regarding the ANOVA of the CSI, a highly significant interaction (category x stimulus) was found ($p<0.0001$). The category "physical status" had higher CSI related to "food consistency" (0.24, ±0.09; $p<0.001$) than other categories. "Solid food" had the highest CSI for "very consistent food" (0.35, ±0.17; $p<0.01$). "Semisolid food" had the highest CSI (0.20, ±0.09; $p<0.001$) related to "bit consistent food". No difference was found between categories for "consistent food" ($p>0.05$). Hence, the consumers had difficulties to associate a category to a stimulus unless it had an adverb of quantity which was more useful to represent a scale. No statistical differences were observed on CSI between the virtual modes ($p>0.05$). For this reason, both modalities of virtual survey might be optimal to identify several characteristics about consumer insights.

Keywords: Food consistency; Cognitive salience index; Consumer insight; Free word association

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Ratão, I., Guerreiro, F., Soihet, S., Matias, T., Guerreiro, A. (2022).
Flor do Algarve – An alternative tasty regional sweet.

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FLOR DO ALGARVE – AN ALTERNATIVE TASTY REGIONAL SWEET

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Introduction: One of the best-known products of traditional Algarve sweets is the "doce fino", a colorful sweet made with almonds, sugar and eggs. However, its consumption should be moderate, since it has a very high caloric value due to the amount of sugar and fat present.

The current consumption trends aim to reduce the amount of sugar and fats present in food and the replacement of animal protein by plant alternatives.

The objective of this work is to develop a new product (flor do Algarve), replacing some of the ingredients traditionally used, in "doce fino" such as eggs and some food coloring, for products of vegetable origin, preferably endogenous from Algarve, such as oranges, but also organic vegetables. Thus, creating an alternative to traditional algarvian sweets adapted to a more demanding market segment, distinguished by innovation and presenting as vegetarian, healthy and safe, but continuing to be interesting from a visual and organoleptic point of view.

Material and methods: Eggs and food colorants were substituted by oranges, pumpkin and spinach. Base dough was obtained with almond flour, sugar and water. The addition of spinach to this dough result in a green dough. Orange flour was obtained from dehydrated orange peel, reduced to power. From the orange flour, with addition of white chocolate, orange nuggets were obtained. Pumpkin threads were obtained from pumpkin, sugar and orange juice. After all these intermediate products were prepared, the "flor do Algarve" was assembled putting pumpkin threads and nuggets in the center, involved by base dough, forming flower petal. Sepals were added using green dough. Orange flour was used to sprinkle the petals, giving a sense of gold.

A panel of 30 trained assessors was used to determine the similarity of the final product with "doce fino" and its acceptability.

Results: The obtained "flor do Algarve" presented similar organoleptic and visual characteristics to "doce fino". 93.3 % of the trained assessors declared to accept the product. During the development of "flor do Algarve", other new products were obtained such as dehydrated orange peel flour and orange nuggets, which presented a high gastronomic interest, since they could be used to prepare other recipes, constituting an important add value to this project.

Conclusion: "flor do Algarve" can be an alternative to "doce fino". The use of orange peel, which is usually a by-product of the food industry, to produce orange flour and orange nuggets, contributes to reduce food waste, thus contributing to the objectives of sustainable development.

Keywords: Product development; Sweet vegetarian alternative; Reduce food waste

Oliveira-Alves, S., Lourenço, S., Anjos, O., Caldeira, I., Fernandes, T. A., Catarino, S., Canas, S. (2022).
Antioxidant activities of wine spirits aged by a sustainable technology using chestnut wood staves and micro--oxygenation.

ANTIOXIDANT ACTIVITIES OF WINE SPIRITS AGED BY A SUSTAINABLE TECHNOLOGY USING CHESTNUT WOOD STAVES AND MICRO-OXYGENATION

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The alternative ageing technology (AAT) using wood staves combined with micro-oxygenation (MOX) applied to wine spirit (WS) stored in stainless steel tanks intends to simulate the ageing process that occurs in wooden barrel (traditional ageing technology - TAT), but in a more sustainable way: less time, lower cost and lower environmental impact. During the ageing process, the oxygen entering through the barrel or applied by MOX plays a crucial role in oxidation, condensation and other reactions involving phenolic compounds extracted from the wood. As a result, the ageing process positively influences the colour, aroma and taste of WSs, which are decisive characteristics in consumer choice. In addition, consumers value foods and beverages with beneficial effects on health, namely the antioxidant compounds. TAT and AAT have been studied by our research team, but little has been investigated on the antioxidant activity and chemical evolution of the aged WS during storage in bottle.

Indeed, it is pivotal to assess the overall quality of the aged WSs during the storage in bottle in order to select the best MOX strategy from AAT. Some factors, including the closure, exposure to light, temperature, bottle position and the availability of oxygen in headspace height, may affect the characteristics of the aged WS during this stage. Thus, this study aimed to examine, for the first time, the influence of the storage in bottle over 12 months on the evolution of antioxidant activities (DPPH, FRAP and ABTS assays) and total phenolic content (TPI) of the WSs aged through three modalities (MOX levels: O15, O30 and O60) and one control (N) from AAT. The work was carried out under the Oxyrebrand project (https://projects.iniav.pt/oxyrebrand), which shows a detailed explanation about the experimental design). Briefly, the samples were aged with chestnut wood by an alternative technology, using 50 L glass demijohns with wood staves in a total of 48 samples (4 modalities × 2 replicates × 2 sampling bottles × 3 storage times).

The antioxidant activities and TPI of the WSs from the four ageing modalities were not different at the beginning of storage (t0). After 12 months of storage in the bottle (t12), the WSs from MOX modalities (O15, O30 and O60) showed higher antioxidant activities and TPI than the control modality (N) one. In addition, the TPI and antioxidant activities were not significantly different between the WSs from the MOX modalities, which showed similar evolution during storage time. This significant increase of the TPI and antioxidant activities for MOX modalities may derive from the hydrolysis of phenolic glycosides and hydrolyzed tannins giving rise to free forms. Thus, the MOX combined with staves resulted in higher preservation of WSs' phenolic contents, assuring the WS quality. The study reveals the efficiency of phenolic compounds from the aged WSs to scavenge free radicals during storage in bottle, suggesting that these antioxidant compounds are preserved after the ageing process, specifically using the AAT, and may have positive health benefits for the consumers.

Keywords: FRAP assay; DPPH assay; ABTS assay; Phenolics; wine spirit; Storage in bottle

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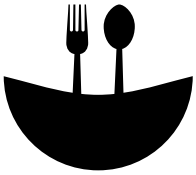
Domingues, J., Guedes, A. P., Meira, M., Brito, N. V., Afonso, I. M. (2022).
Valorization of endogenous wild fruits from Alto Minho region, Northern of Portugal: Bioactive compounds of *Rubus ulmifolius* Schott (wild blackberry).



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VALORIZATION OF ENDOGENOUS WILD FRUITS FROM ALTO MINHO REGION, NORTHERN OF PORTUGAL: BIOACTIVE COMPOUNDS OF *RUBUS ULMIFOLIUS* SCHOTT (WILD BLACKBERRY)

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Rubus ulmifolius Schott is known for its fruits (wild blackberry) which are fresh eaten or as processed products. In Portugal, there are more than a dozen species of blackberries. Its rich nutritional composition and bioactive compounds are the main reasons for the increasing interest on these berries. The high functional value of Rubus species is related to the increase of the consumer interest for these healthier fruits.

Rubus fruits have been highlighted as an important source of bioactive constituents and health promoters, neverthless little information on its composition is available. In the present study, the phytochemical characterization and antioxidant activity evaluation were carried out.

Lyophilized berries were extracted with 70 % (v/v) methanol for phenolic, flavonoids, tannins and anthocyanins quantification. *R. ulmifolius* Schott *hydromethanolic* extracts presented 3376,5 ± 212,8 mg GAE/100 g of total phenolic compounds, 242,8 ± 34,4 mg QE/100 g of flavonoids, 49,9 ± 1,2 mg Cia-3-glu/100 g of anthocyanins and 3143,4 ± 173,4 GAE/100 g of tannins. Antioxidant activity was measured by the DPPH method and showed an IC50 of 2,2 ± 0,3 mg/ml.

Rubus ulmifolius Schott wild berries showed important nutritional and functional values. The present work contributes to the valorization of the natural heritage, wild fruits of Alto Minho region (Northern of Portugal) and raise awareness of the need for preservation of endogenous species.

Keywords: Wild berries; Blackberry; Endogenous; *Rubus ulmifolius*; Bioactive compounds

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BIOACTIVE COMPOUNDS AND ANTIOXIDANT ACTIVITY OF NESPEREIRA-DAS-ROCHAS (*AMELANCHIER OVALIS MEDIK.*)

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The knowledge on plants as well as their nutritional and therapeutic benefits comes from ancient times and has passed through generations. This knowledge has led to several researches of its properties. In recent years, the characterization of several wild berries has been given special attention due to the benefit that their ingestion can present for human health, due to their polyphenol content, whose antioxidant properties have been proven. Even though some wild species have already been highly studied, *Amelanchier ovalis* lacks detailed characterization. It is a relatively rare autochthonous species found in Portugal mainly in the Northwest (Minho) and Northeast (Trás-os-Montes) regions. In order to identify the phytochemical compounds of this species the present study aimed to quantify the bioactive compounds and determine the antioxidant activity of *A. ovalis* berries.

The berries (approximately 250 berries collected at random from different *A. ovalis* trees) were harvested in the municipality of Terras de Bouro (Braga district) in August 2020, freeze-dried and crushed. Methanolic extracts (70 % v/v) were obtained by ultrasound extraction and used for the quantification of bioactive compounds. The Folin-Ciocalteu's method was used for the determination of total phenols and tannins; tannins were measured as the difference in total phenolics before and after treatment with insoluble polyvinylpolypyrrolidone (PVPP). Total anthocyanins were determined by the pH differential method. A colorimetric method with aluminum chloride was used for the determination of flavonoids. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) test was used to assess the antioxidant activity of extracts.

The content of total phenolic compounds in the extract was 15.54 ± 0.32 mg GAE/g sample. The extracts contain 2.08 ± 0.02 mg QE/g sample of total flavonoids and 1.82 ± 0.04 mg Cia-3-Glu/g sample of anthocyanins. The concentration of total tannins accounted for 14.18 mg GAE/g of sample. The results show that A. ovalis berries have a good ability to scavenge free radicals by the DPPH method with an IC_{50} of 5.27 mg/ml.

This preliminary study shows that *A. ovalis* berries seem to be a good source of bioactive compounds that now need a more detailed characterization and a better understanding of their potential for use in beneficial health products.

Keywords: *Amelanchier ovalis*; Wild berries; Phenolics; Flavonoids; Anthocyanins; Tannins

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POTATO PEEL FLOUR: A POTENTIAL INGREDIENT FOR FUNCTIONAL FOODS DEVELOPMENT

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Potato peel (PP) is an agroindustrial waste with a potential use in by products like flour and starch. Also, is a source of many bioactive compounds like fiber and phenolics compounds with antioxidant activity that's why it is an alternative ingredient for foods with functional properties. The aim of this work was to obtain potato peel flour and evaluate their physical and functional properties. PP was obtained from local gastronomic places from Salta, Argentina. Firstly, PP were washed with a solution of drinking water-sodium hypochlorite (1%) at 25±2 °C. Two dehydration process in over were carried out, potato peel processed and whole applying 60±2 and 125±2 °C, respectively. Samples obtained at 60±2 and 125 ±2 °C were ground in a grinder, sieved through a 80 mesh sieve and stored in hermetic bags until use. (aw), pH, moisture, ash, water absorption capacity (WAC), water solubility index (WSI), swelling power (SP) were determined. Total phenols by Folin Ciocalteu and antioxidant capacity evaluated by ABTS assay. ANOVA and Tukey's test ($p<0.05$) with Infostat.18 student version were applied to the data.

Samples	pH	Moisture (%)	aw	Ashes(%)	WAC	WSI	SP	PC (mgEAG/100g)	AA (% Inhibition)
FPP 60 °C	6.63c	13.23d	0.66c	7.18b	4.00b	4.11a	4.17c	195.28b	95.15b
FPP 125 °C	5.60b	5.38a	0.36b	7.00a	4.95d	6.39c	5.37d	216.7d	97.02c
PPP 60 °C	7.02d	10.48c	0.38b	7.50d	3.45a	5.06b	3.63a	169.5a	93.16a
PPP 125 °C	5.54a	10.38b	0.27a	7.45c	4.76c	5.05b	4.00b	201.13c	96.30bc

FPP: Flour potato peel; PPP: Potato pulp peel; WAC: Water absorption capacity; WSI: Water solubility index; SP: Swelling power; PC: Phenolic compounds; AA: Antioxidant activity.

Significant differences were found between the different parameters evaluated ($p<0.05$). The pH and humidity values were adequate according to the Argentine food code. The WAC, WSI and SP values could be related to the degree of starch modification and its ability to form gels. PC and AA values would indicate that the dehydration process at 125 °C of FPP would retain a greater amount of bioactive fractions. It is concluded that PP can be a value-added raw material to be used in the production of food products.

Keywords: Potato peel flour; Functional properties; Bioactive compounds

Cunha, A. M., Pereira, A., Cardoso, A. P., Silva, A. M., Barroca, M. J., Guiné, R. (2022).
Top-of-mind associations with White Crowberries (*Corema album*) in the Portuguese population.

TOP-OF-MIND ASSOCIATIONS WITH WHITE CROWBERRIES (*COREMA ALBUM*) IN THE PORTUGUESE POPULATION

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Corema album's fruits, commonly known as white crowberries, are small white berries (similar, in size, to crowberries) present in the Iberian Peninsula coast. This bush is native of the coastal areas around the Atlantic Ocean, and its presence has been acknowledged for centuries, although in the present its expression has been threatened by the human action in the wild coastal areas. The sensory properties allied to their nutritional value and health benefits have been recognized and, together with the conscience for preservation of natural biodiversity, have alerted for the need to preserve this endogenous resource. Additionally, there seems to be some emotions and traditions related with this fruit, that has been part of the cultural heritage of coastal peoples in Portugal and in Galicia.

In this study, the top-of-mind associations of the Portuguese population with White crowberries ("Camarinhas", in Portuguese) were explored. For that, results of a questionnaire survey were used, specifically concerning the responses given to a particular question, in which the participants were asked to use three to five words or small expressions that they associate with "Camarinhas". Although 501 participants responded the questionnaire, 107 (21.4%) were excluded because they were not familiar with white crowberries and 165 (32.9%) were excluded because they did not provide any word/expression in the open question under study. Hence, the final sample was constituted by 229 valid subjects, and the number of answers was variable between only one and up to five words/expressions per participant. To treat the data, a content analysis was performed using the NVIVO 12 software. Demographic data as sex, age and living environment were also collected.

A total of 893 words (322 unique) were coded into 18 sub-categories, organized in 5 parent categories: "Memories of places, people and times", "Emotions and experiences", "Senses", "Properties & Uses" and "Valuation of Natural Resources". The categories most associated with white crowberries were "Senses" (320 words) and "Memories of places, people and times" (312 words), standing out the subcategories "Visual image" and "Taste" in the first category and "Habitats" in the second. The most mentioned word was beach (n = 78, 6.01%), followed by berry (n = 54, 4.16%) and forest (n = 52, 4.01%).

Posterior analysis should focus on the impact (if any) of the demographic characteristics of the participants on the top-of-mind associations.

Keywords: Crowberries; Beach; Berry; Forest; Content analysis

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RELATIONSHIP BETWEEN BREASTFEEDING AND ATOPIC DERMATITIS

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Atopic dermatitis (AD) is a chronic and relapsing disease frequently observed in childhood. Areas of eczema and intense itching characterize the disease. Its pathogenesis is multifactorial, but diet is suggested as a contributing factor. In this sense, breastfeeding has been related to the incidence of AD. The World Health Organization (WHO) recommends exclusive breastfeeding (EBF) for up to 6 months and advises introducing regular cow's milk after 12 months of age. There are data that EBF for up to 3 or 4 months can decrease the incidence of AD in the first two years of life. However, there is a lack of evidence that EBF for a more extended period can be advantageous in preventing AD. There is no consensus on whether using infant formulas composed of hydrolyzed milk protein may reduce the risk of atopic diseases. The objective of our research was to verify whether the duration of EBF and the introduction of other kinds of milk are correlated with the age of onset of AD symptoms in pediatric patients treated at the Clinical Hospital at Unicamp (Campinas/Brazil). It is a descriptive study with retrospective data of patients with previously diagnosed AD and being followed up at the Dermatology Outpatient Clinic of Clinical Hospital at Unicamp. Forty-five patients, aged between 1 year and 17 years and 11 months, in the presence of their guardian, answered a multiple-choice questionnaire about the duration of EBF and when infant formulas and cow's milk were introduced into child feed. The results showed that more than half of the patients (58%) reported EBF for 4 to 6 months, and this difference was significant concerning the groups that declared EBF for less than 4 months (33%) or were not breastfed (9%). The infant formula introduction occurred before 6 months in 47% of the children, with a statistically significant difference compared to the group that started between 6 and 12 months of life (31%) and after 1 year (22%). It was noted that most patients (73%) started using regular cow's milk after 1 year of life, while 18% started between 6 and 12 months and 9% started before 6 months. The most prevalent age at the onset of AD symptoms was between 1 month of life and 5 years old (64%), only 19% reported since birth and 17% reported after 6 years old. There was no statistical correlation between the time of EBF and the age of AD onset ($p>0.05$). Our data about EBF for 4 to 6 months of life is above the Brazilian data, whose rate is 45% (ENANI, 2019). However, we found that 47% of the patients started using infant formula before 6 months of age, indicating that the most prevalent age for introducing infant formulas was probably from 4 months, which coincides with the end of the maternity leave under Brazilian laws. The end of the maternity leave may be an important cause of interruption in EBF before the child is 6 months old and the introduction of another type of milk. Also, we observed the introduction of regular cow's milk to feed children before 1-year-old, which can be attributed to cultural, educational, and economic factors and the lack of government support. It is worth mentioning that the Food Guide for Brazilian Children (2019) differs from the WHO recommendations and allows the use of pure cow's milk from 9 months of age onwards. We concluded that there was no correlation between the time of exclusive breastfeeding and the age of onset of AD development, even when the infant formula introduction happened earlier than the time recommended by the WHO.

Keywords: Exclusive breastfeeding; Infant formulas; Atopic dermatitis; Childhood

Reyes-González, A. M., Chuck-Hernández, C. (2022).
Partial substitution of milk protein with hydrolysed soybean protein isolate in the production of a panela cheese hybrid for a flexitarian diet: Effects of transglutaminase and $CaCl_2$ on texture and sensory parameters.

PARTIAL SUBSTITUTION OF MILK PROTEIN WITH HYDROLYSED SOYBEAN PROTEIN ISOLATE IN THE PRODUCTION OF A PANELA CHEESE HYBRID FOR A FLEXITARIAN DIET: EFFECTS OF TRANSGLUTAMINASE AND CACL2 ON TEXTURE AND SENSORY PARAMETERS

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The rise of flexitarianism has been reflected through the growing consumption of plant-based proteins and other vegetables. However, reports state that people who use plant-based alternatives also consume animal products. Considering the population is not fully committing to a plant-based diet, hybrids allow for a reduction in animal product consumption and an increase in protein intake. Nevertheless, as the incorporation of plant proteins into dairy products affects their characteristics, achieving a dairy hybrid becomes a challenge from a process point of view.
Since vegetable proteins have very different functional characteristics in water absorption, solubility, and interaction with the fat fraction, soybean hydrolysates were created to facilitate their integration as low-molecular-weight peptides in the casein-fat network of panela cheese, one of the most popular dairy products in Latin America. Additionally, transglutaminase (TG) and calcium chloride have also been explored to improve texture and stability. These could favor the incorporation of soy hydrolysates into the hybrid structure of this fresh cheese.

Five treatments were tested: control cheese without soybean protein (A); cheese with soybean isolate + $CaCl_2$ (B); with soybean isolate + $CaCl_2$ + hydrolysis treatment (C); with soybean isolate + $CaCl_2$ + TG (D) and with soybean isolate + $CaCl_2$ + TG + hydrolysis (E). Additionally, a small survey of the Mexican population's dairy consumption patterns and preferences was conducted.
Milk was pasteurized for 30 min at 63ºC and cooled to 32ºC. According to the experimental design, $CaCl_2$ (0.125% w/v) was added and mixed. The soybean protein isolate (1.25% w/v of milk) was hydrated in distilled water, adjusting to keep a solids content of 12.5% for the final solution. Then, the hydrolysis of the soybean protein was performed with an alkaline protease at pH 8.0 for 3 h at 60ºC and inactivated at 85ºC for 15 min. These protein solutions were added to the milk and mixed. Transglutaminase (1.92% of total protein) was added immediately before rennet (0.03% v/v) for the cheesemaking. The resulting curds were cut, dehydrated, salted, and placed in molds for 3 h. Finally, the product was stored at 4ºC until analysis. Texture and sensory parameters were evaluated.

Survey results indicated that more than 60% who use regular dairy products also use plant-based alternatives and that almost 80% showed interest in trying dairy hybrids. In both cases, the 18-25-year-olds consumed significantly more dairy alternatives and had a greater interest in hybrids.

Sensory analysis showed higher acceptability in treatments with hydrolysis (C and E) compared to B and D, but lower than control. Appearance was the category that affected the acceptability the most because the soybean protein in treatments was visibly distinguishable. In addition, the hydrolysed cheeses had low-molecular-weight peptides and, therefore, a more homogenized appearance and a slightly higher general opinion. Texture profile analysis revealed hydrolysed treatments had the lowest values in all four categories: hardness, cohesiveness, springiness, and chewiness. Nonetheless, TG increased all texture values, which helped achieve more similar values to the control treatment.

In conclusion, these findings show that a hydrolysis treatment and TG have the potential for developing a panela cheese hybrid, as consumers seek to reduce but not completely avoid their dairy intake and are open to trying dairy-vegetable products. However, an improvement in appearance is necessary because of its effect on acceptability.

Keywords: Panela cheese hybrid; Hydrolysed soybean protein; Transglutaminase

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CHEMICAL COMPOSITION OF *CYTISUS SCOPARIUS* (BROOM)

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Invasive plants represent a major problem when the subject is biodiversity since these species lead to the reduction of other species due to their higher adaptability, being considered an extremely serious problem. Thus, it is in this context that this work is carried out, which aims to determine possible valorization paths of *Cytisus Scoparius*, better known as Broom and with that contribute to the development of products with this material in order to consume the excess material that is otherwise burned.

For a better understanding of the possible products that can be obtained from this material, a complete chemical characterization of several components was made to the branches (CsB) *Cytisus Scoparius*. The ash content was determined according to Tappi T 211 om-93. Metal cations were analyzed by the ICP. The extractive content in acetone, dichloromethane and water was determined according to Tappi T 204 om-88. The protein content was determined by the treatment with 1% pepsin solution in 0.1 M HCl. The tannin content was evaluated in extractive and proteins free sample by reflux with 0.3%(m/v) NaOH under nitrogen atmosphere. In the determination of lignin content, the Klason method was followed by the TAPPI T222 om-88 standard. The cellulose content was determined by the Kürscher and Höffner method (method 1). Holocellulose was determined by the acid chlorite method followed by α-Cellulose (method 2). The hemicellulose content was determined by difference.

Studies on chemical composition revealed that the material is lignocellulosic, presenting approximately 37.8% cellulose according to Method 1, followed by 21.9% tannins and lignin 15.7%. However, according to Method 2, it has about 36.9% α-cellulose, hemicellulose 30.4% and insoluble lignin 20.1%.

This lignocellulosic material can be converted in a liquefied material that can be further processed to replace the polyol in polyurethane foams or can be used for the production of adhesives.

Keywords: *Cytisus Scoparius*; Chemical composition; Ecovalorization; Agro-industrial residues

Vinha, A. F., Sousa, G. M., Sousa, C., Brenha, J., Sampaio, R. (2022).
Phenolic profile from the pomace of two portuguese grape varieties: sustainability and food safety as new natural additives.

PHENOLIC PROFILE FROM THE POMACE OF TWO PORTUGUESE GRAPE VARIETIES: SUSTAINABILITY AND FOOD SAFETY AS NEW NATURAL ADDITIVES

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Grapes are one of the most produced fruit crops worldwide. About 75% of produced grapes is planned for wine production, originating 20-30% of waste products. This waste is mainly constituted by grape pomace, which includes fruit peels, remaining pulp, seeds, and stalks. Moreover, therapeutic properties of plants and their by-products have been increasingly described, because of their strong antioxidant values, absence of side effects, and economic viability. Synthetic antioxidants have been used as supplements, however, their utilization in foods has health concerns. Grape pomaces have biotechnological potential, having been applied in several studies as fortification ingredients in foods. Reuse of the grape pomace depends on its composition and characteristics. Because grape pomace is a highly perishable product (due to the high moisture content) and given the high volumes generated during harvest season, the utilization of fresh grape pomace is unfeasible and requires an appropriate method of preservation. Thus, grape pomace can be reused to extract oil, to obtain antioxidants, and prepare antibacterial agent´s. Additionally, from a nutritional perspective, polyphenols are the most important constituents of grape pomace. Large amounts of the residual quantities of bioactive substances remain in the vegetable tissues: phenolic acids, several flavonoids, flavanols (e.g., catechin, epicatechin and epigallocatechin) and other phenolic compounds (proanthocyanidins or condensed tannins). Given the importance of winemaking in Portugal and considering that the extraction of polyphenols from grape pomace represents an attractive, sustainable, and cost-effective source of high-value biological properties, which could be incorporated into foods, as natural additives, the phenolic profile of two national grape pomace varieties (Touriga Nacional (red) and Alvarinho (white)) was studied. Phenolic compounds were identified and quantified by Reverse-Phase High Performance Liquid Chromatography (RP HPLC) equipped with a diode array detector (HPLC-DAD). Results revealed a broader spectrum of bioactive compounds, as well as higher levels in red grape pomace. Some phenolics, such as vanillic acid (0.18 mg/g) and syringic acid (0.09 mg/g), were found only in red grape pomace, while quercetin (0.40 mg/g) was found only in white grape pomace. In fact, quercetin is a flavonoid that does not possess much expression in the colour of plant products; however, it is easily found in abundance in nature. All identified compounds are phenolic acids, flavonoids (flavanols and flavonols) or stilbenes. Catechin, epicatechin and epigallocatechin were the major compounds in both grape pomaces, reinforcing their use as functional additives, as these compounds have been associated with important biological properties such as antibacterial functions (for catechin and epicatechin) and free radical scavenging and anti-inflammatory activity (catechin). The predominant flavonoid present in red grape pomace was rutin, also known as vitamin P, recognized for its antineoplastic, antioxidant, antidiabetic, anti-inflammatory, antibacterial, antifungal, neuroprotective, cardioprotective, hepatoprotective, nephroprotective and hepatoprotective properties. The results present on this work prove that the recovery of phenolic compounds from grape pomace is one of the viable possibilities to reuse this waste as a cheap source of rich bioactive compounds that can, later, be used on other industries.

Keywords: Phenolic profile; RP-HPLC; Grape pomace; Portuguese grapes varieties; Natural additive

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