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TABLE OF CONTENTS

OPENING AND KEYNOTE LECTURE

THE TWILIGHT OF COMMODITY SCIENCE. DON'T CONTEMPORARY ECONOMISTS NEED TO KNOW ABOUT COMMODITIES?

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Dedicated to the memory of Professors Gerhard Vogel, Mitsuharu Mitsui and Josef Hölzl

The history of commodity science is as old as time. In ancient times, codes (such as the Code of Hammurabi) were drawn up to define the requirements for good quality goods and the penalties for non-compliance. During the Middle Ages, the science of commodities developed mainly in Europe, starting in Italy and spreading to Austria, Germany and the countries of Central and Eastern Europe. At the turn of the 19th and 20th centuries, scientific studies on commodity science appeared. Centres for commodity science were established in many countries. Around 1770, Johann Beckmann, a professor at the University of Göttingen in Germany, established commodity science and technology as a new university discipline. In Austria, commodity science can be traced back to the Vienna World Exhibition of 1873 and was later introduced at the Imperial Export Academy Vienna, founded in 1898, which became the University of World Trade in 1919 (now WU Wien). In Poland, the science of commodities gave rise to higher business schools in Krakow and Poznań. It has developed in Bulgaria, Romania, Russia, Slovakia, Ukraine, China, Korea and Japan.
Commodity science is currently in a twilight period in many countries. In this presentation we will consider the reasons for this: on the one hand, many specialists have retired and many famous people have passed away. On the other hand, commodity science is being replaced by quality science (e.g. in Poland commodity science has disappeared from the list of scientific specialities in favour of quality science) and marketing. We will also consider whether it is not necessary for a marketing specialist to know about the properties of commodities. Mainstream economics excludes any conceptual link between commodities and money. Paul Samuelson has no index entry for "commodity" in his Economics (ninth edition, 1973). Don't modern economists need to know about commodities?
Today, economists are hardly aware that commodities have a material nature with an ecological and social life cycle. Their knowledge focuses on an economic life cycle, which they try to optimise mainly in monetary terms. This has created many of the problems we face today: supply chain problems, resource problems, environmental problems and so on.
In addition, the perception of commodities is increasingly subject to virtual reality. This affects a) standardisation, safety and other aspects of quality management, and b) consumption. Commodities are very well described on internet marketing platforms and delivered to the home in a very short time. This virtual world promises unlimited consumption without the need to reflect on the background, and it also makes it possible to justify consumption as green (often only green-washed). We will give some examples of the positive and negative sides of this development. However, this virtual and abstract view of commodities consumes a lot of energy. It is likely that, even if we were able to base it on renewable energy, the system's inherent promise of unlimited consumption will be limited by material cycles and ecological problems such as greenhouse gas emissions, quantities of waste, toxic substances, and so on. We will explore the material and ecological nature of

commodities and the proposed solutions such as circular economy and eco-design (which, by the way, have been promoted by commodity scientists and neglected by economists in the past).
To answer our question, it seems that economists and economic policymakers do not need commodity science from their increasingly virtual and abstract perspective, but they may be surprised by social and environmental problems in the future that they did not anticipate.

Keywords: commodity science, quality science, lifecycle assessment, eco-design, circular economy

FOOD SAFETY CULTURE AND JUST CULTURE IN FOOD SAFETY MANAGEMENT

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Discussing food safety incidents forces more attention to organizational culture, including the behaviour and attitudes of food operators toward food safety compliance. The presentation is devoted to the phenomenon of food safety culture (FSC), the lack of which has been recognized as one of the so-called new emerging risks to food safety. The presentation addresses the origins of this phenomenon, as well as its importance for the organization and the consumer. Attention is given to pioneers of FSC research, such as F. Yiannas (2009) and Ch. Griffith et al. (2010). The most popular definitions of FSC are cited, including the one pointed out by Griffith et al. (2010): "The aggregation of the prevailing, relatively constant, learned, shared attitudes, values, and beliefs contributing to the hygiene behaviours used within a particular food handling environment". In the presentation, the author also points out the existing research gap as far as researchers in Poland are concerned. It is emphasized that FSC is already a permanent element of private food law, as well as European food law. The author also refers to a very important phenomenon, an element of FSC, that is just culture (JC), and offers her own definition as follows: "JC in the food sector is an element of FSC and is one in which all employees within a food company are encouraged to provide and feel comfortable providing FS-related information. It is an atmosphere of trust in which food handlers are convinced they will be treated fairly on the basis of their actions rather than the outcome of those actions, in the case of positive, as well as negative FS events". The author points out that the JC phenomenon is completely unknown in the food industry, despite the fact that JC is used and implemented in other types of sectors, such as healthcare, aviation, energy, military, etc., identified as high-reliable organizations. She adds that the implementation of FSC is not possible without the implementation of JC. The presentation also discusses the conditions for implementing FSC and JC in the organization, such as food safety management, management style, leadership, communication, commitment, environment, risk perception and awareness, and food safety performance. The next part of the presentation is a discussion of ways to measure FSC. In this case, qualitative, quantitative, or mixed methods can be used. It is important that the measurement takes place systematically. The presentation concludes by pointing out new possible research directions on the FSC phenomenon.

Keywords: assessment, food safety, food safety culture, implementation conditions, just culture

CHARACTERIZATION AND VALORIZATION OF AGRICULTURAL AND FOOD INDUSTRIAL WASTES – THE CASE OF COFFEE PRODUCTION

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Illegal or non-regulated disposal of agricultural and food industrial wastes is causing enormous environmental problems throughout the world. Currently, large quantities of agricultural side products are wasted – since many of them are unpalatable, and even not suitable for animal feeding. Generally, the absence of a local processing industry has been a major obstacle for the farmers esp. in many developing countries. For example, around the world only 6-10% of cashew apples are used commercially, and in most cashew-processing countries, vast quantities of cashew apple go entirely to waste or are used only as compost. The forthcoming increase in world population demands for more efficient ways to achieve sustainable development and use of renewable sources. Rising concern on environmental issues drives ahead the improvement of sustainability by closing production cycles underlying the increased need to develop policies and solutions to solve these problems. This trend is also witnessed by a growing amount of research focused towards improving both environmental and economic benefits through efficient reuse of resources. Residues resulting from food production are often not adequately re-utilized, and the present contribution will discuss the potentials of selected agricultural waste products, which do contain a series of substances of commercial interests, which could be used to produce an add-on value. Processes used for the valorization of wastes streams must be able to incorporate new technologies, which would improve the environmental foot-print to the existing waste product management. Sustainable green technologies often involve the use of solvent extraction processes for recovery of bioactive substances form industrial wastes which could be for example replaced by means of supercritical technology, which is more effective. Such secondary streams of value added compounds are gaining more commercial and economic impact providing a rich alternative for the supplementation of health promoting minor nutrients (e.g. vitamins and antioxidants or alternative protein resources) to the local diet. The treatment of agricultural and food industry by-products is generally realized by oxygen-driven biological methods, such as composting, which serves a dual purpose i.e. valorization via manurial value and as well as decreasing the pollution potential. The second principle treatment approach concerns realization of sustainability by application in fuel production including biogas, ethanol, biodiesel or in briquetting of wastes. Literature survey reveals that also the valorization of the solid industrial/agricultural by-products in the nonfood sector is gaining more prominence as a valuable alternative. In the last decades the process of fermentation has also gained a stronger value driven impact while utilizing the microbes for a more selected and targeted biotransformation to higher end value products or product compositions. The goal of many such strategies is to consider the safety, quality and sustainability of food production and to develop technological prospects for improving the current situation by decreasing the impact of the wastes produced. Therefore, such an integrated approach improves the production chain, while also determining the potentials of new applications from the waste/by-products released. On this background it is necessary to identify and develop intervention strategies at an early stage in the production chain, such that corrective measures necessary can be implemented to improve the quality in the waste product management – finally resulting in economically viable products with add-on properties. A sustainable water, resource and energy supply and high environmental and quality of life are at the center of such projects. Here, innovative ideas are needed in the fields of resources protection and renewable resources, water and waste treatment as well as improved efforts for recycling and closing material cycles. The presentation is also going to focus on the coffee processing because it is the generated

wastewater which causes serious problems for the environment in coffee producing countries such as Guatemala and offers on the other hand the possibility of using it as a by-product. There has been a significant amount of studies regarding valorization of coffee by-products. Some potential utilization possibilities are available, but further work in this area will definitely be more helpful for the maintaining of global environment and waterways.

Keywords: coffee wastewater, coffee by-products, recovery of valuable materials, coffee fermentation, filtration, environment pollution

FROM FOOD WASTE TO FUNCTIONAL FOODS: APPLICATION TO THE CEREAL SUPPLY CHAIN

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Food waste is an environmental, economic and ethical issue. There are several points in the supply chain where it is possible to intervene to reduce food waste. At the household or mass catering level, the reuse of any kind of leftovers, common in the past, should be encouraged. On the other side, the food industry produces large amounts of waste, as a result of issues in the processing or storage phases, generating further food loss. Waste and/or by-products from the food industry are not fit for consumption in their original state but in many cases contain several residual nutrients and bioactive compounds. Assuming these materials are safe, they still remain substantially underutilized.

Cereal-based food products are widely consumed and are perfectly suitable for being functionalized by the addition of extracts of food industry waste/by-products, possibly obtained by means of green extraction techniques. Alternatively, waste/by-products can be used directly, after drying and powdering.

A number of case-studies will be presented, where dry and fresh pasta, biscuits, bread and other baked goods have been effectively fortified with industrial residuals from the milling of wheat and pulses, wine-making, olive oil production, artichoke canning, and almond confectionery industry. The sensory quality of the finished products must be in any case carefully taken into consideration to avoid decreasing the acceptability by the consumer. By balancing the level of fortification, the enriched products become carriers of bioactive compounds but maintain a good technological and sensory quality.

Upcycling the food industry waste/by-products represents a possible strategy to improve sustainability, adding value and satisfying consumers demand for functional foods.

AGRICULTURAL GREENHOUSE GASES AND FOOD SECURITY INEFFICIENCIES IN COUNTRIES WITH DIFFERENT LAND PRODUCTIVITIES: POLICY ORIENTATION AND GLOBAL TARGETS

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Globally, the agricultural sector is responsible for the emission of ca. 9.3 gigatons of CO_2 equivalent annually. The objective of this work is to assess agricultural greenhouse gases (GHG) and food security long-term inefficiencies in countries with different levels of farming productivity. The analysis focuses on non-radial slack that, theoretically, may be easily reduced by the improvement in available resource management. The DEA-based hybrid super-efficiency meta frontier model with undesirable output was employed, and the estimations for different model orientations were compared. The dataset consisted of data from 99 countries (2005–2018) that were divided into three clusters. A realistic efficiency model orientation, accounting for agricultural policy objectives in a given country, is a crucial premise for finding the optimal path for achieving global GHG targets. It was found that by reducing inefficiency slack, agricultural emissions can be decreased by 0.74 Gt of CO_2eq per year. Hence, removing management inefficiencies would help achieve up to 80% of the global reduction targets in agriculture without a substantial technological change. However, the efficiency change component turned out to be mainly negative over the period studied; thus, a specific focus on agricultural policy is needed in terms of supporting farmers with a more rational use of their resources. The successful implementation of agri-environmental measures may be dependent on good-quality advisory support.

ORAL PRESENTATION

SESSION 1. PRODUCTS QUALITY AND SUSTAINABILITY – CONSUMERS PERSPECTIVE

HOW TO BUILD INTENTION TO REDUCE CONSUMPTION? THE MEDIATING ROLE OF SELF-EFFICACY

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According to the degrowth concept, it is necessary to reduce material consumption and the use of natural resources in order to achieve a more sustainable and equitable economy. It means that consumers in wealthy countries should consider reduction of their level of consumption what can be hard to be widely accepted by these societies. The objective of the current study is to examine the role of self-efficacy in building intention to reduce consumption voluntary. We hypothesized that self-efficacy mediates both the impact of environmental knowledge on intention to reduce consumption and the impact of social norms on the same intention. We also hypothesized that the strength of the mediating effect is determined by country of origin.
Data was collected by CAWI method from 850 respondents: 440 in Poland, 410 in Spain. To test the hypotheses, we used Generalized Linear Model (GLM) mediation analysis within the jAMM module in Jamovi. The current research results showed that both environmental knowledge and social norms lead to intention to reduce consumption through self-efficacy. The mediating effect of self-efficacy is strong especially in case of environmental knowledge which influence on intention to reduce consumption is visible only with self-efficacy mediation. We also found that the impact of self-efficacy on intention to reduce consumption is different in researched countries – it is stronger in Spain.

Keywords: degrowth, consumption reduction, self-efficacy

INCLUSIVE CONSUMER – EXPLORING THE PERSPECTIVE OF HIGHLY SENSITIVE STUDENTS

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This abstract delves into the experiences and challenges faced by highly sensitive individuals, particularly in the university setting, shedding light on their unique perspectives within both society and higher education. The research analyzes effective coping strategies employed by highly sensitive students, who are consumers of education offered by the university.
Through a qualitative inquiry, the research examines their journey of self-discovery and heightened awareness of high sensitivity, illuminating its profound impact on their academic and personal lives. The study comprehensively investigates potential negative consequences, while also uncovering the perceived benefits and advantages of embracing high sensitivity.
The findings from this study hold significant implications for educational institutions, workplaces, and support networks. They encourage open dialogues that genuinely embrace and uphold the unique experiences of highly sensitive individuals as valued consumers of education and university services. This research significantly contributes to the expanding body of knowledge on this subject, aiming to cultivate environments that celebrate diversity, prioritize individual well-being, and duly acknowledge students as crucial consumers of educational offerings.

Keywords: Highly Sensitive Individuals, university life, Academic Challenges, inclusivity, education consumers

YOUNG-ADULT CONSUMERS' PERCEPTIONS OF A FOOD PRODUCT IN RELATION TO THE PRESENTATION OF FOOD ADDITIVES – A PILOT STUDY

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In recent years, there has been an increased awareness of nutrition among the public. This has resulted in consumers seeking healthier foods that are no longer designed to satisfy hunger, but also have adequate nutritional and health value. Also, there is often a trend among consumers to avoid food additives, mainly those described with the 'E' symbol, and to associate them with anti-nutritional or even harmful properties. Hence, the aim of our study was to determine consumer attitudes towards the form of presentation of food additives and their quantity in a food product.

A proprietary questionnaire was used for the study, in which respondents evaluated the product (healthiness, desirability, arousal of negative emotions and overall quality) written in different forms (5 products) and with different contents of food additives (3 products).

The study included 106 participants 18-35 years of age (median 23 years; 18-35 years), with a median weight and height of 60 (46-125) kg and 169 (150-191) cm, respectively. The median BMI in the study group was 21.8 (16.9-45.4) kg/m^2. Products with food additives written with the full name were scored better compared to products with food additives written with the 'E' symbol (55.71±28.6 points vs 37.83±36.6 points, respectively). This difference was statistically significant ($p<0.0001$, t-test). Products with additives written under the full name were better rated in terms of healthiness, desirability, overall quality, and raised fewer concerns ($p<0.0001$, t-test). This relationship was observed in all but one product. Products with the least amount of additives were rated best, and as the amount of additives increased, the product rating decreased ($p<0.0001$, Friedman test).

In conclusion, young adult consumers prefer products with less food additives, and the recording of these substances in the form of the full name promotes a better rating.

Keywords: food additives, E symbol, product healthiness, product perception, consumer behaviours

WHAT CONSTITUTES A PRODUCT'S GREENNESS? THE PERSPECTIVE OF ACADEMIA, BUSINESS AND REGULATORY INSTITUTIONS

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The purpose of the study is to analyse and synthesize the extant green product definitions, examined from the perspective of science and market practice. An increasing number of consumers pay attention to sustainable consumption and seek for greener alternatives of products and services. In response to this need, companies expand their portfolio of green offerings (Sharma, Aswal, Paul, 2023). Green products have also become an important research topic in management sciences over the last few years (e.g. van Doorn, Risselada, Verhoef, 2021). Yet, there is still a lack of a holistic, universal and commonly accepted green product definition (Sdrolia, Zarotiadis, 2019), addressing the academic, business and regulatory perspective.

Taking into consideration this research gap, the author reviews and synthesizes the existing literature on green product definition and the regulations issued by institutions which provide certificates for green products. Green products are generally defined in the scientific literature as goods with more positive or less negative impact on the natural environment in their whole life cycle, compared to conventional products. The product greenness is not considered a dichotomy but rather a spectrum. Scholars most often mention product and packaging biodegradability, use of recycled or recyclable materials and lack of toxic ingredients as main characteristics of a green product. Manufacturers and regulatory institutions pay more attention to the lack of animal testing, natural ingredients and compatibility with the "3R" (reduce, reuse, recycle) rule in defining green products. Meanwhile, consumers most often view green products as biodegradable, without harmful ingredients and generally safe for the planet. They also recognise green products by iconic and indexical cues, such as ecolabels, packaging colour and material. The author summarises the results with own definition of a green product, taking into consideration the current market conditions.

Keywords: desk research, green marketing, green product, literature review, sustainability

SESSION 2. EMERGING TECHNOLOGIES FOR QUALITY AND QUALITY MANAGEMENT

DIGITAL PRODUCT PASSPORT (DPP) AS AN IMPORTANT MECHANISM SUPPORTING THE CIRCULAR ECONOMY

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The concept of "cradle-to-grave" product tracing is not a new approach in the fight for sustainable production and consumption. Collecting information about the product's environmental impact at every stage of the life cycle helps in designing products and methods of production/use that are more appropriate to the circular economy. However, the effectiveness of such an approach requires the involvement of many participants in the whole product life cycle (producers, distributors, users, waste collectors, etc.) as well as gathering reliable and useful information about the product. Accelerating and directing these changes on the European market should be ensured by the Circular Economy Action Plan (CEAP) adopted by the European Commission in 2020 and subsequent normative documents introducing the so-called Digital Product Passport (DPP) as a tool for collecting and sharing data on product's characteristics and origin.
Batteries and accumulators will be covered first by the "passport obligation", followed by textiles and construction materials. Subsequently, DPP regulations are planned for electrical and electronic devices, and over time the system is to ensure digital tags for various products. It would allow for safe and convenient recording of transactional and sustainability-based data. The data carriers could be QR codes, RFID, or NFC tags, i.e. various technical solutions available via smart device applications (e.g. installed on smartphones). The most rational solution would be the creation and maintenance of a decentralized, coherent system of distributed data, which would be based on already existing identification and communication standards (such as GS1).
The article presents the areas that can be supported by the introduction of the Digital Product Passport in the effective functioning of the circular economy and increasing the products' sustainability, repairability, and recyclability. Not only the benefits were shown, but also the anticipated limitations and reservations that appear from manufacturers, consumers, re-sellers, and recycling entities.

Keywords: circular economy, Digital Product Passport (DPP), product traceability

LIFE CYCLE ASSESSMENT OF SUBSTRUCTURE CONSTRUCTION USING VARIOUS TECHNOLOGIES

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Study presents results of environmental impact of three technologies for railway substructure construction: traditional method using aggregate, substructure stabilized using hydraulic binders and geogrid-reinforced substructure. The environmental impact was determined using Life Cycle Assessment with cradle-to-grave approach. The choice of impact and damage categories analysed resulted from ReCiPe – the life cycle impact assessment method applied. The detailed numerical inventory data were provided by the company offering substructures construction. The industrial data and environmental impact of production processes were taken from ecoinvent 3.8 database. The model created considered aggregate extraction, transport of raw materials, excavation and construction works as well as disposal scenario. In case the method using geogrids, acquisition of resources needed for plastic production, polypropylene granulate and geogrid manufacturing and electricity consumption were also taken into account. The endpoint indicators obtained demonstrated that the method resulted in the highest environmental damage was traditional technology. The remaining two methods had lower environmental implications. For the damage category related to human health and ecosystems, the lowest results were obtained for subgrade construction using geogrid, while for the resource category the method with the lowest environmental burden was technology applying hydraulic binders. In the case of the traditional method and the technology using geogrids, transport processes contributed the most to the overall environmental effect. In the case of technology using hydraulic binders, the damage indicators were dominated by the production of quicklime and cement. General conclusions were not changed by sensitivity analysis carried out that verified the impact of different emission standards and energy sources on the results. Uncertainty analysis was also carried out with the Monte Carlo method.

Keywords: Life Cycle Assessment, substructure construction, environmental impact

ASSESSING DIETS FORMULATED BY CHATGPT: SAFETY, ACCURACY, AND TRADEOFFS FOR FOOD ALLERGIES

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The introduction of ChatGPT, a large language model developed by OpenAI, has sparked interest in using Artificial Intelligence (AI) in various areas including diet planning. The study investigates the credibility of dietary advice formulated by ChatGPT for people with food allergies. Fifty-six prompts were formulated for hypothetical individuals with specific food allergies, considering different levels of dietary restrictions and calorie intake. The safety, accuracy, and attractiveness of the diets were then evaluated by a professional dietitian.

The findings reveal that while ChatGPT generally provides accurate dietary advice, it has the potential to produce harmful diets. The safety assessment highlights the inclusion of allergens in nut-free diets and insufficient warnings regarding low-calorie diets. Other errors include inaccuracies in portion sizes, calorie calculations, and menu composition. However, diets developed by AI model also exhibit strengths, adhering to basic dietary guidelines and providing safety warning in most cases.

The accuracy assessment reveals some shortcomings, including the failure to generate menus for specific allergens and miscalculations of food quantities and energy values. The attractiveness assessment shows also other issues such as impractical portion sizes, lack of recipe descriptions, and repetition of ingredients, making the diets monotonous and difficult to follow.

Improving the safety and accuracy of large language models like ChatGPT is crucial. Fine-tuning by qualified professionals and considering expert judgments can enhance the credibility of the dietary advice provided. However, even with improvements, there is a risk of misleading non-qualified users. This study highlights the potential of AI-generated diets to mislead individuals and emphasizes the importance of caution when relying solely on robo-diets.

This preliminary study contributes to understanding the limitations and challenges associated with using AI for dietary advice and underlines the need for further research in this field.

Keywords: artificial Intelligence (AI), ChatGPT, dietary advice, food allergy, nutrition, robo-diet

GENOMICS AND TECHNOLOGICAL FEATURES OF LACTIC ACID BACTERIA ISOLATED FROM ALHEIRA, A TRADITIONAL FERMENTED SAUSAGE PRODUCED IN PORTUGAL

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Lactic Acid Bacteria (LAB) play a crucial role in determining the flavor, texture, and nutritional properties of fermented foods. This study aimed to investigate the diversity of LAB in alheira, a traditional Portuguese fermented meat sausage. For this, 63 LAB isolates were obtained from 28 alheira samples collected from different regions of Portugal, including Vimioso, Mirandela, Vinhais, Mogadouro, Povoa de Lila, Bragança, and Valpaços. The LAB isolates were reactivated in Man, Rogosa, and Sharpe or M17 agar and then subjected to molecular identification using the 16S gene. Genomic DNA extraction was carried out with the GF-1 Bacterial DNA Extraction Kit, and amplification of the 16S gene was performed by 27f (5'- AGA GTT TGA TCC TGG CTC AG-3') and 1492r (5'- CTA CGG CTA CCT TGT TAC GA-3') primers. The sequencing reactions were made with BigDye™ Terminator v3.1, and samples were purified with SAM/BigDyeXTerminator™ bead solution. Capillary electrophoresis was conducted with the SeqStudio Genetic Analyzer. The BLAST algorithm was used to obtain alignments with ≥97% identity with reference sequences from the NCBI database. In addition to molecular identification, the LAB isolates were evaluated for *in-vitro* proteolytic activity (mm), L-lactic acid (g/L), acidifying capacity, and antimicrobial capacity against *Salmonella* Typhimurium, *Listeria monocytogenes*, and *Staphylococcus aureus*. The data obtained were assessed by Principal Component Analysis (PCA). Genetic analysis of samples revealed a diverse LAB population, *Enterococcus faecium* was the most abundant species (27%), followed by *Leuconostoc mesenteroides* (19%). The acidification was mainly contributed by *Enterococcus* (*E. faecium* and *E. durans*), while *Leuconostoc*, *Pediococcus*, and *Lactiplantibacillus* exhibited higher inhibition diameters values against *S.* Typhimurium (PC1=58%, PC2=19.3%), *L. monocytogenes* (PC1=53.9%, PC2=19.4%), and *S. aureus* (PC1=56.3%, PC2=18.5%) in addition to high proteolytic activity, as revealed by the PCA analysis. Finally, the results indicated that *Lactiplantibacillus plantarum* was the LAB species with higher inhibitory effects against the three pathogens analyzed. These results indicate that a comprehensive characterization of LAB can be valuable for improving food safety and quality control.

Keywords: fermented sausages, food biotechnology, lactic acid bacteria, molecular identification

SESSION 3. FOOD QUALITY AND SAFETY MANAGEMENT

DIFFERENT FACES OF FOOD ADULTERATION. FROM INNOCENT OPTIMIZATIONS OF PRODUCT COMPOSITION TO TREATMENTS THAT CAUSE SERIOUS HEALTH RISKS

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Food adulteration is definitely not a new phenomenon on the market. The number of possible examples is countless. Despite the actions of various institutions and owners of quality standards like the need to analyze and mitigate the risk of counterfeiting, the reality and practice is constantly growing. Through its Probase360 project, FoodFakty.pl decided to support food industry to reduce risj of adulteration and started to conducts worldwide monitoring of information on adulterated products to let industry take faster and better decisions. The project covers over 100 countries, all information is aggregated in a functional database and made available to production and commercial entities in order to improve their preventive systems. In addition to the register of cases communicated mainly by local portals of relevant inspections, a standardized system of classification and data analysis is applied. Statistical module allows for a very deep understanding of trends and mechanisms of falsification.
The lecture will discuss the aspects of applicable legal definitions and those contained in quality standards. A case study model implemented into Probase360 will be described. The main part of the speech will be a presentation of the currently observed falsifications, their nature and distribution.
The Top 10 categories of the most frequently counterfeited products will be discussed. Finally, some recent examples from organized coordinated inspection and police activities in the EU and other markets will be presented to underline importance and risk for consumers

Keywords: food safety, quality, food fraud, GFSI

DEVELOPMENT OF SHORT FOOD SUPPLY CHAINS IN A POST-PANDEMIC ENVIRONMENT - A FARMER'S PERSPECTIVE

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Farm participation in short food supply chains is the way of increasing economic surplus by bypassing intermediate links in the creation and distribution of agricultural commodities. In times of crisis, this is particularly important due to the fact that farms, with a weaker negotiating position in relation to their trading partners, are hit harder by the economic downturn. Thus, the aim of this study is to indicate to what extent the post-pandemic crisis has affected the economic condition of farms participating in short marketing chains and whether the crisis itself was a pretext for taking up direct sales activities. The research problem also involved assessing agricultural producers' perceptions of the impact of the post-covid crisis and identifying adaptation strategies to the new conditions.

The study was based on survey research carried out in the form of in-depth interviews conducted by members of the research team as part of a scientific project titled 'Small farms and short food supply chains under economic crisis – evidence from COVID-19 pandemic'. The research sample consists of 200 farms from Poland, divided into farms participating in short supply chains and those not involved in such activities. This approach allows for a comparative analysis of the two groups of actors. Interviews are being conducted from July 2023. As the survey focuses on family farms with a low and medium production scale (these account for more than 90% of the farm population), two sample selection criteria have been adopted: the size of the agricultural area up to 30 hectares, the size of the global production up to EUR 50,000. Preliminary results indicate that the crisis caused by the COVID-19 pandemic has not caused unduly negative consequences for the economic functioning of farms. Moreover, some of the farms involved in short supply chains indicated an improvement in their financial performance due to an increase in consumer interest in food purchased directly from the agricultural producer. Among the noticeable factors determining economic activity, the increase in the costs of energy, fertilizers and plant protection products was mentioned, which resulted in the implementation of adaptation measures in the form of their more economical use.

Keywords: farms, post-pandemic crisis, Poland, short food supply chain

The study is based as part of the project of the National Science Center no. 2021/43/I/HS4/01090

NOTIFICATIONS ON HONEY IN THE RAPID ALERT SYSTEM FOR FOOD AND FEED (RASFF)

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Notifications concerning honey reported in the Rapid Alert System For Food and Feed (RASFF) accounted for 0.6% of all notifications and were submitted between 1999 and 2021, with the highest number of notifications in 2000-2008. These 514 notifications were sent within the product category "honey and royal jelly". The aim of article was to analyse the notifications on honey in the RASFF taking into account the following variables: hazard category, hazard, notifying country, country of origin, notification type, notification basis and action taken. The data was exported from the archived RASFF database to a Microsoft Excel file and pre-processed used the "vertical search" function, pivot tables, sorting and transposition. Then the data was transferred to Statistica 13.3 and subjected to joining cluster analysis using the following settings: linkage rule – Ward's method, distance measure – Euclidean distance and vertical icicle plots.

Notifications on honey related mainly to residues of veterinary medicinal products (e.g. chloramphenicol, streptomycin, sulfathiazole, nitrofuran metabolite, tylosin). Reported products were submitted by Western European countries (Spain, Germany, United Kingdom, Italy, Belgium) and originated mainly from Asian (China, Turkey, Vietnam), South American (Argentina) and Eastern European countries (Ukraine, Bulgaria). These were primarily information notifications, and to the lesser extent also alerts. Products were submitted after official controls on the market, border controls and were re-dispatched, recalled and withdrawn from the market. In order to maintain the safety of a particular type of food such as honey, it is necessary to continue with official market and border controls. Producers should pay particular attention to the proper use of veterinary medicines on bees. Furthermore, as the honey notified in the RASFF originated mainly from non-EU countries, consumers should take special note of the origin of this product.

Keywords: cluster analysis, European Union, food safety, honey, RASFF

ASSESSMENT OF SUSTAINABILITY AND FOOD SECURITY IN SELECTED EUROPEAN COUNTRIES AND REGIONS

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In the current period of unstable socio-economic situation and the impacts of climate change, it appears that even the countries of the European Union are increasingly exposed to the risk of food insecurity. When evaluating food security in the article, we base ourselves on two pillars – access and sustainability which include 7 relevant indicators. Namely, prevalence of moderate or severe food insecurity, share of food consumption expenditures, gross domestic product, median equalised disposable income, government support to agricultural research and development, agricultural factor income per annual work unit and ammonia emissions from agriculture.

Based on the mentioned pillars, the goal of the research is the assessment of food security through the construction of food security index for 26 countries of European Union in the time 2015-2020. The data are collected from the FAO, World Bank and Eurostat databases. From a methodological point of view, a multidimensional statistical method - principal component analysis - is used to determine the weights of the indicators within each pillar. The achieved results are compared with the published Global Food Security Index.

The obtained results show that the prevalence of moderate or severe food insecurity in 2019 was highest in Latvia (11.3%), Portugal (11.5%), Bulgaria (13.2%), and Romania (13.9%), and the lowest in Austria (3%), Germany (3.4%), and Belgium (3.7%). The majority of the monitored European countries experienced a decline in the prevalence of moderate or severe food insecurity between 2015 and 2019. According to the created index of food security, the EU's most food secure nations are Denmark and Ireland, while Bulgaria and Romania have the highest levels of food insecurity. Based on the results we can see, that as household income rises, so does the value of the food security index. The Czech Republic is the most food secure country among Visegrad group. It is followed by Slovakia, Poland, and Hungary, which has the lowest level of food security index.

Keywords: access, correlation analysis, food security index, principal component analysis, sustainability

THE USE OF EMERGING METHODS IN DETERMINING THE EFFECTIVENESS OF NUTRITION LABELS

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Nutrition labels of food composition or ecological parameters of packaging have come to the fore within current food market trends which influence consumer food choices. Ultimately, however, price is still much more important in purchasing decisions than nutritional composition or packaging made from environmentally friendly or recyclable materials. In general, consumers are increasingly choosing foods based on their health benefits, provided that their intake allows them to do so. Since the food consumed also impacts the future health of consumers, it can be considered a key motivational aspect in relation to changing dietary habits and nutrition labels can offer guidance in their selection. However, there are several types of nutrition labels, which differ in visual attractiveness and comprehensibility. Within testing the perception of these labels using eye tracking, although the more direct labels (including Nutri-Score and NutrInform based on Guideline Daily Amounts) attract less visual attention, they lead to better ratings and understanding of nutritional quality. Other researches suggest that these labels are mostly unable to influence dietary behavior change.

This study focuses on the Nutri-Score and NutrInform nutrition labels. The aim was to reveal the impact of the effectiveness of nutrition labels and other factors on consumer decision-making in choosing healthier alternatives for selected food types. Traditional research methods (questionnaire) with emerging methods (eye tracking and face recognition) enabled a more comprehensive view of consumer decision-making through the collection of implicit feedback. Research suggests that there are significant differences between implicit and explicit feedback when examining the impact of nutrition labels. The study also presents ideas for future research in real-world settings using emerging methods.

Keywords: emerging methods, front-of-pack nutrition label (FOPL or FOPNL), Nutri-Score, NutrInform, nutrition labelling

This research was supported by the project VEGA 1/0624/22 "Neurogastronomy: Application of Implicit and Explicit Approaches in Modern Experience Gastronomy and their Influence on Consumer Behavior".

DEVELOPMENT OF BACHELOR'S AND MASTER'S TRAINING IN ENTREPRENEURSHIP AND QUALITY MANAGEMENT AT STATE UNIVERSITY OF TRADE AND ECONOMICS

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The State University of Trade and Economics (SUTE) is a multi-disciplinary higher education institution of the European level and has been training specialists in the fields of economics, entrepreneurship, trade, quality management and many others for more than 75 years both in the base institution (Kyiv) and in 13 of separate structural units (3 institutes, 8 colleges, 2 specialized schools) in 9 cities of Ukraine.

SUTE trains specialists under 62 educational programs of the first (bachelor's) level (including 5 in English), 65 programs of the second (master's) level (including 14 in English), 15 programs of the third (educational and scientific) level. The educational process is aimed at meeting the needs of the labor market, the formation of competitive advantages and innovative competences in the students.

The training of bachelors and masters in commodity science, entrepreneurship and trade at SUTE is carried out within the framework of the specialty "Entrepreneurship and trade" and includes 6 educational programs both at the first bachelor's level and the second master's level.

The training of management specialists, including the quality of goods and services, is carried out within the "Management" specialty and includes 10 educational programs at the first bachelor's level and 12 educational programs at the second master's level.

Mastering of the European and international experience through participation in international projects is an important aspect of the competences formation of entrepreneurship specialists. To date, SUTE is implementing of 10 projects, including one under the ERASMUS KA-2 program and 9 under the Erasmus + Jean Monnet program.

Thus, SUTE introduces European approaches to training a new generation of the nation's intellectual elite at all levels of higher education, taking into account modern requirements, the latest educational technologies, international standards and European integration aspirations of Ukraine, using modern material and technical support. SUTE is open to the further development of international cooperation with foreign partners, the world leading universities, educational and scientific centers, which will give impetus to the development and implementation of new mutually beneficial international projects.

Keywords: educational process, training of specialists, bachelors, masters, entrepreneurship, trade, quality management

SESSION 4. SUSTAINABLE PRODUCT DESIGN

FUCOXANTHIN RICH MICROALGAE FOR THE AGE APPROPRIATE CARE OF SMALL ANIMALS

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Algae are a popular foodstuff in East-Asia and parts Europe, they provide vitamins and essential fatty acids and are relatively low in calories. The most important carotenoid in the marine environment is Fucoxanthin, which has been shown to possess protective activities against non-communicable diseases such as obesity, cancer, inflammation, diabetes, and cardiovascular as well as liver diseases. These positive effects to date have been shown in experiments in cell culture, in rodents, and in selected human studies.

The background for our approach is the increasing prevalence of non-communicable diseases in domesticated animals. The aim of our project was to create prerequisites to produce Fucoxanthin-rich products as animal feed additives for the pet food segment, based on scientifically tested health claims. The developed product could be used for targeted weight reduction therapy for overweight animals.

First, the microalgal growth and Fucoxanthin yield inside of closed systems was analysed using the microalgae *Phaeodactylum tricornutum*, a diatom that serves a model organism and contained the highest concentration of Fucoxanthin among previously examined candidates. The growth systems consisted of translucent tubes containing algae water with different salt concentrations that were additionally exposed to different light colours. These experiments showed that the water drained from a production cycle could be fed back into the algae cycle.

Subsequently we investigated the influence of the form of delivery on the bioavailability of Fucoxanthin in small animals. A dietary intervention study was designed for mice. Animals were divided into 6 groups of 8 animals of each sex and received either a purified diet, or modified diets simulating either an *in natura* or a highly processed form of consumption. After 14 days animals were humanely euthanized and organ and serum samples were dissected and flash frozen Results show that Fucoxanthin bioavailability is greater in female mice and correlates negatively with degree of processing.

Currently a pilot production of a dog feed containing Fucoxanthin has begun, and a feeding experiment will be conducted in order to ascertain the approval of the feed formulation by dogs and owners, as well as the bioavailability of the carotenoid in carnivore animals.

Keywords: anti-obesity, fucoxanthin, microalgae, *Phaeodactylum tricornutum*

COMPARISON OF PHYSICOCHEMICAL AND MICROBIOLOGICAL PROPERTIES OF *ALHEIRA* SAUSAGES FROM TWO ARTISANAL PRODUCERS IN THE NORTHEAST OF PORTUGAL

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Alheira is a traditional fermented sausage produced in Northern Portugal. The objective of this study was to evaluate the variability of relevant physicochemical and microbiological attributes of alheiras produced by two regional producers with distinct manufacturing processes.

Alheiras were sampled at production day (T0), middle of ripening (T1) and as a finished product (T2) from each producer. Washed tripe, cooked meat and paprika used in production were also collected at T0. Counts of mesophiles, coliforms, *Escherichia coli*, *Staphylococcus aureus*, presumptive *Clostridium perfringens*, and detection of *Salmonella* spp., as well as pH, water activity (a_W), and proximate analysis were determined.

Producer A, which had a shorter production time (7 days) than producer B (14 days), presented sausages with greater pH variability than B, likely due to a shorter fermentation. Similarly, producer A also presented higher a_W variability than B, related to a shorter drying period. Significant differences were seen in the composition of alheiras from each producer, with producer A using more meat and producer B more fat, but both still employing high levels of fat and carbohydrates.

The washed tripe, cooked meat, and paprika presented expected mesophilic and coliform counts. *Salmonella* spp. was detected in two samples of tripe of producer A, and presumptive *C. perfringens* was detected in tripe of both producers. *S. aureus* was detected in cooked meat of both producers, suggesting post cooking contamination due to improper hygiene.

Mesophilic counts rose throughout the ripening process in both producers, which is desirable, as it implies the growth of lactic acid bacteria necessary for fermentation. Regarding *S. aureus*, it presented an initial rise followed by a rapid decline, likely due to a pH drop caused by fermentation. However, an increase in *S. aureus* counts was seen on the final product of producer B, indicating a faulty fermentation. As for *C. perfringens*, it was detected in low levels in both producers, most probably related to its initial presence in washed tripe.

Both producers presented great between batch variability, something the consumer expects from artisanal products. Stricter hygiene practices should be implemented to reduce microbial loads of raw materials and prevent contamination of the end product.

Keywords: food safety, hygiene indicators, non-ready-to-eat sausage, pathogens

MODIFICATION OF WATER VAPOUR BARRIER PROPERTIES OF COMPOSTABLE FILMS USED FOR FOOD PACKAGING

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Biodegradable polymers have been available on the market for about 30 years. It is a diverse group of materials both in terms of the raw materials used in production (renewable, non-renewable) and in terms of performance characteristics. Biodegradable polymers can be processed by almost all industrially used polymer processing methods, thanks to which thin and flexible films produced by cast and blow methods, packaging and packaging elements produced by injection, bottles by injection blow molding technology and thermoformed trays or cups are available on the market. Biodegradable polymers used in the packaging industry are subject to special requirements regarding the safety and extent of their use, but also the time and conditions of decomposition in the biodegradation process. Every packaging material becomes waste after its end of life and should be recycled according to the appropriate material path, in this case industrial (or backyard) composting. Therefore, all biodegradable packaging materials must be compostable and meet international standards: ISO 17088, EN 13432 in EU, ASTM D6400 in North America, AS 4736 in Australia and GreenPla in Japan.

The production of compostable packaging materials allows modification of their composition and the use of many additives, provided that they comply with the above-mentioned standards. Monomaterials (e.g., PLA, PCL, TPS), multimaterials (e.g., PBAT with PLA), copolymers (e.g., PBAT, PHBV) are available on the market, which allow to improve processing and functional properties. Compostable plastics are also used to produce coatings, for example, to coat paper. Compostable plastics exhibit a number of limitations that have so far significantly inhibited their widespread use in packaging applications, including high price of raw materials and materials, small scale production, lack of legal incentives and financial benefits of introducing them to the market, the lack of regulations related to their processing in industrial composting plants and the lack of consumer knowledge, but also unsatisfactory barrier properties and low mechanical strength. Proposal for a regulation of the European Parliament and of the Council on packaging and packaging waste (PPWR) finally offers a chance to increase the market popularity of compostable materials by mandating their use for sticky labels attached to fruit and vegetables and very lightweight plastic carrier bags.

In the paper, surface modification of compostable packaging film was carried out by hand-coating with a chitosan solution, obtaining a coating with a thickness of 20μm. The modified film was tested for determination of water vapour transmission rate (WVTR) by weight method based on ASTM E96/E96M-16, tensile strength (PN-EN ISO 527-3:2019-01) and puncture (PN-EN 14477:2005), and sensory analysis (DIN 10955:2004). Modification through the application of the coating improved WVT by 23%, increased mechanical strength by 16%. However, the increase in stiffness resulted in a decrease in puncture resistance. It was also shown that the modified film did not change the taste or odour when in direct contact with food products. The research is a pilot study.

Keywords: packaging, compostable materials, chitosan, WVT, coating

THE COMPARISON OF THE EFFECT OF VARIOUS ENVIRONMENTS ON THE DEGRADATION OF POROUS POTS MADE FORM BIO-POLY(BUTYLENE SUCCINATE)

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Agriculture is a sector, in which plastics are used to increase quality of products, crop protection and enable fruit and vegetables growth despite the season. Irrigation systems consisted with plastic water pipes prevent water losses and leaking, so water is distributed efficiently. From ecological point of view, the most important aspect of polymers used in agriculture should be their ability to degrade or compose in appropriate time for their usage, for example, polymer products could be left in soil to degrade after fulfilling its purpose. One of the most researched, eco-friendly materials is poly(butylene succinate). Over the last decades, development of biotechnology has allowed production of substrates for the synthesis of poly(butylene succinate) from biomass fermentation products. This opened production of a biodegradable polymer, where fossil sources were replaced by plant-based resources of natural origin. This fact has made BioPBS™ one of the most promising polymers with a wide range of applications including film and nonwoven composites. Presented study was focused on the influence of different degradation environments on the structural changes of BioPBS porous pots.

The aim of the research was to establish types of changes undergoing within polymer structure during hydrolytic and soil degradation. The nonwoven pots were prepared from the first commercially available bio-based BioPBS™ FZ71PM, manufactured by PTT Mitsubishi Chemicals Corporation. In this study two degradation environments were taken into consideration, first being hydrolytic degradation in various pH according to standard ISO 21701:2019. Second degradation environment was soil degradation, which was carried out at the lettuce plantation in Plovdiv, Bulgaria and in Mydlniki, Poland. The effects of degradation on the changes of nonwoven morphology were evaluated using photography documentation and a Nova NanoSEM 230 Scanning Electron Microscope. The microstructures of the obtained materials were analyzed – degree of crystallinity, the crystallographic form of the crystals, the melting point and glass transition, using Wide-angle X-ray Diffraction and Differential Scanning Calorimetry. The mechanical parameters of the studied materials, such as tensile strength, were measured using a mechanical testing machine.

During the degradation time, volume of the pots samples decreased, suggesting a significant mass loss. Organoleptic and photographic documentation revealed lack of a clearly visible influence of the change of pH of the hydrolytic medium on the rate of degradation. The mass percent remaining after the time of degradation in hydrolytic environment shows, that after 12 weeks of hydrolysis in pH 6,6 and 10, fragments of pots have a mass loss of approximately 25%, while in pH 3,5 only 10%. The degree of crystallinity increased from 47% to 55% in 3 months during degradation in soil and, for example, to 58% during hydrolytic degradation in pH 3,5. During degradation in soil, degree of crystallinity increased significantly between 3rd and 8th weeks, then remained almost unchanged, opposite to hydrolytic degradation, where polymer crystalized almost linearly. The supramolecular structure has become more ordering, with a lower content of mesophase and amorphous phase, which results in samples becoming more fragile, which was visible organoleptically. Thermal analysis

of poly(butylene succinate) pots performed before and after degradations showed in all thermograms the melting point of PBS – approximately 116^{o}C. Investigation of mechanical properties for the samples degraded in soil, showed decrease in stress at break from 21,8 MPa to 7.7 MPa after 4 weeks and to 4,6 MPa after 8 weeks. Samples from hydrolytic degradation after 4 weeks were fragmented into smaller pieces, which unable mechanical testing.

Presented research on the degradation methods of biobased poly(butylene succinate) presents thorough review of the macro, micro and supramolecular changes undergoing in the material. These results indicate the strong degradation of poly(butylene succinate) in soil and water. The changes in the thermal and mechanical properties, and increase of degree of crystallinity were observed in every sample in both degradation environments. Many samples of nonwoven pots were almost completely degraded after 12 weeks of soil and water degradation. The changes in the mechanical properties as a function of degradation time clearly show a large decrease in the elasticity of the nonwoven pots, during the degradation process, both in the biodegradation process in soil and in the hydrolytic degradation in different pH. In conclusion, results of this analysis could be useful in choosing the most effective degradation method for given application of nonwoven products made from biobased poly(butylene succinate).

Keywords: agriculture, biopolymers, biodegradation, hydrolysis, polyesters, soil, supramolecular structure

ECOLOGICAL TRENDS IN DESIGN ON THE EXAMPLE OF WORKS OF INDUSTRIAL DESIGN STUDENTS

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Eco-friendly trends are found in practically every area of life. Circular economy, including waste management and minimization of the exploitation of natural resources, are new ways of developing the world economy, aimed at reducing the destructive impact on humans in recent years. An important aspect is the new materials trends, which are the result of work in the field of materials engineering in the broad sense of the term, is focused on the development of bioplastics with a known life cycle. Among these materials worth mentioning are polymeric bioplastics, such as polylactide or polybutylene succinate. There polymers are produced from renewable sources, products made from them are compostable which can contribute to minimizing waste.

These activities are also important for industrial design. That is known to students and graduates of industrial design engineering at the Lodz University of Technology, who in their final thesis decide to use eco solutions, including the selection of environmentally friendly materials. The student projects are developed, among other things, on the basis of bioplastics so as to minimize their impact on the environment, and are concerned with various areas of life. The presentation will highlight a selection of engineering works that show how eco-friendly plastics can be used in industrial design.

Keywords: ecology, circular economy, bioplastics, industrial design, 3D printing, biodegradation, composting

SESSION 5. ADVANCED METHODS FOR QUALITY CONTROL

ANALYTICAL STRATEGIES FOR IDENTIFYING FLAVOUR COMPOUNDS ASSOCIATED WITH VIRGIN OLIVE OIL CHARACTERIZED WITH GREEN FRUITY POSITIVE ATTRIBUTES AND LOW LEVELS OF SENSORY DEFECTS

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Extra virgin olive oils (EVOO), according to their legal definition, lack of sensory defects. In fact, a virgin olive oil is categorized as an EVOO, according to their sensory characteristics, when it has an absence of negative attributes (defects = 0) and a fruitiness median above zero (> 0). Within this category, there is a wide range of possible sensory profiles, which are associated to many factors, such as cultivar, ripeness, and climate. Those different sensory profiles are due to differences in the qualitative and quantitative composition of volatile compounds. Numerous research works have been focused on identifying these volatile compounds, their origin, and more recently, their evolution over time and the effect of technological and agronomical factors. However, the relationship of these volatile compounds with specific positive attributes requires certain research strategies that combine the perfection of analytical techniques, the improvement of repeatability and reproducibility of the analysis, and also the standardization of the sensory assessment of positive attributes by panelists. On the other hand, the presence of sensory defects at low levels also makes difficult the study of EVOO, in particular of those that are in the borderline of the quality category. In fact, these sensory defects, even if they are at low levels, may also have a certain effect in the sensory characteristics of food formulations. In this work, due to the complexity of EVOO aroma and those samples in the borderline, different methodologies for volatile analysis, implementing different extraction techniques were studied together with different data processing strategies. The high amount of information from the headspace fraction of the oil served to identify differences in the volatile composition that were associated to “green fruity” and “ripe fruity” aromas. This work has contributed to understand better the positive attributes and to contribute for a better definition of these attributes in EVOO, as well as to identify those volatile markers that are indicative of sensory defects at low intensity.

Keywords: sensory quality, SPME-GC-FID/MS, virgin olive oil, volatile compounds

SPECTROFLUORIMETRIC ANALYSIS COMBINED WITH CHEMOMETRICS FOR VARIETAL AND QUALITY ASSESSMENT OF RED WINES FROM SOUTHERN ITALY

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Polyphenols constitute a wide group of natural substances produced by the secondary metabolism of plants, particularly known for their positive action on human health and food quality. Based on their chemical structure, they can be distinguished into flavonoids and non-flavonoids. Polyphenols are especially abundant in fresh fruits and vegetables, but also in tea and wine, where they contribute to the main quality attributes of the product. They are responsible for the colour of red wines, notes of bitterness and astringency, slow down oxidative degradation phenomena, and their presence makes the ageing process possible. Since they are considered important descriptors of wine quality, several analytical methods for their identification and quantification have been implemented over the years, including targeted and non-targeted techniques. Among the latter, fluorescence spectroscopy has proven particularly effective for routine analysis due to its rapidity, selectivity, and sensitivity, providing a molecular fingerprint of the samples under investigation. Since phenolic compounds related to wine quality are naturally fluorescent, this study evaluated the use of an absorbance-transmission and fluorescence excitation-emission matrix (A-TEEM™) technique combined with chemometrics for the quality assessment of typical Southern Italy red wines obtained from different varieties.

Specifically, wine samples were diluted (1:150) with a buffer solution for A-TEEM™ analysis, and their excitation-emission matrices were recorded between 240-800 nm (excitation) and 248-830 nm (emission). Next, parallel factorial analysis (PARAFAC) was used to decompose the three-way array into an appropriate number of components, defined by using core consistency diagnostics and split-half analysis. The obtained components were assigned to different fluorophores present in the wine samples based on the literature data. Then, both three-way (PARAFAC, and N-way partial least squares (N PLS)), and two-way (PLS) approaches were used to develop calibration models between fluorescence spectra and the concentration of compounds of interest determined by UHPLC-DAD-MS/MS. In addition, the fluorescence properties of the studied wine seemed promising to classify the samples according to the varietal origin.

Keywords: chemometrics, excitation-emission arrays, fluorescence, parallel factorial analysis, regression, spectroscopic methods, quality, wine phenols

VITAMIN B2 DERIVATIVES AS A SINGLET OXYGEN PHOTOSENSITIZER

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A wide range of 7-arylflavins have been studied in acetonitrile regarding their spectral and photophysical properties. The introduction of an aryl/hetaryl group through a direct C–C bond has been shown promising approach for tuning the photophysical properties of flavin derivatives. The reported novel flavins are compared to "basic" derivatives such as 5-phenyl-5-deazaflavin, 3,10-dimethylisoalloxazine, and 7,8-dimethylalloxazine. The presence of aryl groups at position 7 caused a bathochromic shift in the absorption bands. The shift is more pronounced with thienyl and 4-methoxyphenyl groups, while it is less pronounced with 4-cyanophenyl and 2-methoxyphenyl groups. Therefore, the significant bathochromic shift in the absorption bands makes these flavins suitable for application in visible light photoredox catalysis.
Significant effects of aryl substitution on the fluorescence maxima and quantum yield have been observed. The singlet oxygen quantum yield (Φ_Δ) for flavins is generally expected to be high. However, it is notably below 20% for the 7-(2-methoxyphenyl) derivatives and even lower than 1% for the 7-(3,4,5- trimethoxyphenyl) derivatives. This property is appealing when designing flavin photocatalysts suitable for photooxidative electron transfer processes, as it helps to avoid potential "type II" oxygenation reactions. Additionally, it increases the stability of flavins in photocatalytic systems.

Keywords: absorption, 3D emission excitation matrix, fluorescence, phosphorescence, photo redox catalysis, vitamin b2 derivatives

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THE APPLICATION OF NEAR -INFRARED SPECTROSCOPY IN QUALITY ASSESSMENT OF HERBAL TEAS

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Herbal teas have been popular for centuries as a beverage with broad health benefits and an aromatic bouquet of flavour. The food industry is a fast-growing industry worldwide. With the ever-increasing consumer interest in tea drinks, there is also the problem of potential adulteration of ingredients, which negatively affects the safety and quality of the product. Blends (rosehip - coriander, coriander - cumin, green tea - dandelion root, licorice - lemongrass) and unadulterated raw materials were tested by near-infrared spectroscopy and statistical analysis was used.

NIR spectra were measured in the range between 12500 and 400 cm^{-1}. Spectra were analysed using the multiple linear regression method (PCA - MLR). The reduction of the number of variables (PCA) was carried out for two ranges of wavenumbers. The first range covered wavenumbers from 12489 to 4775 cm^{-1}, while the second range was from 11309 to 3594 cm^{-1}. In both wave ranges, the correlation coefficient was close to 1, with a lower standard error of estimation in the second range compared to the first range. The use of the PCA-LDA analysis of previously obtained spectra made it possible to distinguish more expensive and cheaper raw materials and their mixtures. In the case of models that included 30%, 50% and 70% adulterants, the effectiveness of the LDA method was 100%. In addition, in the case of models created for two ranges of wavenumbers (11309 - 3594 cm-1 and 12489 - 4775 cm^{-1}), covering all mixtures (form 5% to 95%), the result of 100% efficiency was again achieved for three series of mixtures. However, in the case of dandelion root - green tea, the effectiveness was 90% for the first range and 88% for the second range.

Based on the conducted research, it can be concluded that the measurements of near-infrared (NIR) spectra, together with the statistical analysis of the obtained results, are an effective method of detecting adulteration of herbal teas.

Keywords: food quality, food adulteration, herbs, herbal teas

SESSION 6. SUSTAINABLE FOOD

UPCYCLED FOOD PRODUCTS – SUSTAINABLE SOLUTIONS FOR FOOD WASTE

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Food wasting is a global crisis that paradoxically accompanies food shortages. Food waste can be generated at any stage of the food product life cycle, increasing the amount of landfilled waste and causing money losses. Upcycling refers to the creation of new value through another stage of recycling. As a new food category, upcycled food faces several challenges, such as the development of a definition, inclusion in the food waste hierarchy and public acceptance.

The purpose of the article is to analyze existing solutions available on the market for upcycling by-products from food processing plants and food wastes. Analysis was performed from the perspective of food producers, food processing companies as well as consumers.

Upcycled food production has recently been introduced as a food waste management option, so including it in the food waste management hierarchy is crucial. Upcycled foods are most often present on the market as food and beverages, personal care products, health care products, animal feed as intermediate products or ingredients in food and beverages, pet food and cosmetics. Manufacturers should inform the public about the benefits of using upcycled ingredients. This will also have a significant impact on future labeling strategies for policymakers, providing valuable information for upcycled food producers. When customers are informed about the unique nutritional or environmental advantages of upcycled food, their moral satisfaction with their purchase of upcycled food rises, which is favorably correlated with their willingness to buy upcycled food.

Keywords: upcycled food, by-product, food waste, sustainable solution, upcycling

UNDERSTANDING THE CONSUMER BEHAVIOUR OF GENERATION X AND Y REGARDING FUNCTIONAL FOODS

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In recent years, a notable shift in dietary preferences and health awareness of consumers has caused a rising interest in functional foods. Functional foods have become a significant worldwide trend in nutrition as consumers attempt to maintain healthier lifestyles and enhance their general well-being. These novel foods are uniquely created to target particular bodily systems or illnesses, providing additional health advantages above and beyond their fundamental nutritional content.

The objective of the study is to evaluate the consumer behaviour of Generation X and Y regarding functional foods. The research is based on primary data obtained from an online questionnaire survey. A total of 292 responses from the questionnaire survey were collected from Generation X and Y consumers during the months of April and May 2023 in the Slovak Republic. To evaluate the dependencies between selected demographic characteristics (gender and place of residence, education) and the consumption of functional foods, the Fisher exact test and Chi-Square test of independence were used. Based on the results, consumers with university degrees of Generation X tend to consume functional foods more often. The results show that women living in urban areas expressed greater interest in consuming functional foods compared to men in both generations. The main barriers why consumers do not consume functional foods are primarily due to the taste and higher prices compared to conventional food. The most critical factors which would encourage consumers to consume functional food in terms of importance are recommendations from a doctor, improvement of health and prevention against health risks. When investigating purchasing behaviour, the Friedman test was used, and slight differences occurred. The main determinants affecting the purchasing decisions of Generation X are price, previous experience, discount and health claims. On the other hand, Generation Y is mainly influenced by previous experience, food compound and price. In both cases, the least important determinants affecting the food purchases are mainly the design of the packaging, the labels “vegan” and “lactose-free”, and the material of the packaging.

Keywords: consumer behaviour, food marketing, functional foods, health trend, purchasing behaviour

ORGANICALLY FARMED YERBA MATE PERCEIVED BY A SELECTED GROUP OF CONSUMERS

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A growing consumer interest in organic food is currently being observed, which is defined in Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 as a product developed without the use of artificial fertilisers and pesticides. The provisions of this regulation apply to food produced within the European Union as well as products imported into the EU market from third countries, such as Yerba Mate. Consumers' interest in organic products is offset by an increase in their awareness of sustainability principles as well as the perception that organic products are safer for their health.

Over the last years, a significant increase in Yerba Mate imports and increasing availability of organic Yerba Mate has been noticeable. The aim of this study is to assess consumers' perceptions of organically grown Yerba Mate and to identify the factors, both positive and negative, conditioning the purchase of this product group. A questionnaire survey is selected as the research method. The choice of the research group is purposefully non-random and the group of respondents consisted of Yerba Mate consumers associated in a group of lovers of this product on the social network platform Facebook.

The article presents the requirements for the production of organic Yerba Mate and the benefits, according to consumers, associated with the consumption of organic Yerba Mate. The results obtained show that the main determinants of choosing organic Yerba Mate are the absence of chemical contaminants and higher taste qualities compared to conventional products.

Keywords: organic products, organic Yerba Mate, consumer attitudes

TASTE THE SWEET REVOLUTION: AN URBAN STUDY ON CONSUMER BEHAVIOR TOWARDS FLAVOURED HONEY AMONG THE IGENERATION

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The aim of the study was to identify consumer behaviour and attitudes of iGeneration in the market of flavoured honey. The presented study is based on primary data obtained by implementing consumer research in 2023. In total, 40 urban honey consumers participated. The research included both questionnaire survey and sensory testing where respondents evaluated 5 different types of flavoured honey (cocoa and hazelnuts, cinnamon, raspberry, grapes and ginger). The results showed that urban consumers representing iGenerations mostly consume honey occasionally (40%) with annual consumption 1 -2 kilograms (50%) or less than 1 kilogram (30%). Most respondents indicated the preference for the following honey flavours: any ingredient rich in antioxidants or other health promoting substances, traditional fruits, exotics fruits and herbs. The least preferred were the edible insects. Furthermore, the most importance motives for consumption were indicated as follows: taste, immunity booster, vitamin content and health benefits. The sensory research revealed that the highest evaluation was obtained by honey with cinnamon in nearly all examined sensory attributes followed by honey with cacao and hazelnut in taste attribute and honey with raspberry in colour. Honey with grapes (resveratrol) acquired the lowest evaluation in terms of taste, consistency, and overall acceptance. All in all, the results provide interesting insights for honey producers for extending their product portfolio by producing honey enhanced by various ingredients and flavours.

Keywords: iGenerations, consumer preferences, flavoured honey, Slovakia

The research was funded by the project VEGA No. 1/0415/21 "Interdisciplinary research on consumer behaviour on the honey market with an emphasis on its quality and nutritional value" from The Ministry of Education, Science, Research, and Sport of the Slovak Republic, by the Grant Agency of The Slovak University of Agriculture in Nitra, grant number 14-GASPU-2021 "Analysis of consumer behaviour towards honeys enriched with health-promoting substances" and by the Operational Program Integrated Infrastructure within the project: Demand-driven research for the sustainable and innovative food, Drive4SIFood 313011V336, co-financed by the European Regional Development Fund.

SESSION 7. SUSTAINABILITY AND CIRCULAR ECONOMY

ASSESSING SUSTAINABILITY OF RECYCLED STRETCH FILM

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According to European recommendations for sustainable development and circular economy, reducing the plastic compounds is a fundamental goal for all the production processes. The use of plastics in agriculture presents some critical issues principally linked to their disposal. These plastics, due to poor management, could be disposed of in unauthorized dumping sites or burned uncontrollably in the fields. The implementation of a virtuous process of recovering plastic waste directly from farmers and recycle it as secondary material could play a very important role in facing the environmental concerns that the growth of use of plastics in agriculture brought. This paper aims to analyze methodological issues related to the sustainability assessment of recycled stretch film used in agriculture. In particular the life cycle assessment (LCA) methodology was adopted to calculate the environmental performance of the overall life cycle of recycled stretch film with a "from cradle to gate" approach. Indeed, as far as the system boundaries the following sub-phases were taken into account: a) the process of collection of used stretch film from some European countries, b) production of recycled stretch film, c) storage and d) selling to consumer. The paper goes through the main aspects of the creation of the life cycle inventory, starting from the process of data collection carried out with the collaboration of some local companies, until the solutions adopted for solving the lack of information of some input of the system. This paper aims to show the results of the first step of a deeper life cycle analysis focused on an example of the creation of a closed loop in agriculture. This allows us to understand the complexity in the assessment of the real sustainability of the circularity of processes and could help LCA experts and practitioners deal with the main methodological issues met during a life cycle assessment.

Keywords: sustainable packaging, Life Cycle Assessment (LCA), circular economy, recycling, stretch, agriculture

MANAGING CIRCULARITY OF PACKAGING FOR FOOD PRODUCTS – CARBON FOOTPRINT ASSESSMENT OF INNOVATIVE COATED PAPER PACKAGING

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Food products pose a big challenge from the perspective of circular economy not only by its manufacturing processes but also by the its packaging needs and requirements. The paper presents the innovative coated paper (CP) materials for food product packaging from the perspective of its circularity potential. The objective of the paper is to assess six coated paper packaging with the use of Carbon Footprint (CF) method in order to check the circularity potential and its relation to environmental impacts. The circularity potential is assessed through the following aspects: the recycling of CP and the use of recycled paper for CP packaging manufacturing. The assessment is made on the life cycles of the product within CP packaging. Sensitivity analysis for the assessment is focused on impact of recycling improvement scenario and recycled content involvement scenario on overall CF.

The results of the assessment show relatively small contribution of CP packaging to the CF. The recycling and recycled content scenarios bring significant and positive effect on CF in every investigated case. The recommendation from the study is to introduce both scenarios simultaneously and focus on eco-management strategies in order to get the biggest progress towards circularity.

The paper presents partial results from the project titled Functional & re cyclable coated paper packaging for food products (REPAC²) that is co-financed by Polish National Centre for Research and Development (NCBR) within CORNET initiative.

Keywords: food packaging materials, coated paper, carbon footprint, sustainability, circularity

STRATEGIC CSR MANAGEMENT OF MED-TECH CORPORATIONS (PILOT-STUDY)

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The concept of corporate social responsibility (CSR) has been known since mid-20th century. Established in 2015 by the United Nations, the 2030 Agenda identified 17 sustainable development goals that, through legal regulations, have become a platform shifting the social responsibility of businesses from marketing activities to strategic management of organizations. Questions regarding the diffusion and implementation of the strategy of global corporations, emerging barriers, adaptation or lack of modifications taking into account cultural differences, attitude of strategic managers at the local level, confirm the importance of the raised topic in the context of existing social problems.

The presented pilot-study focused on the Polish subsidiary of a global MedTech company in the context of CSR strategy. The triangulation of data sources and methods of data collection was employed, utilizing analysis of existing data (website content, reports, KRS documents), as well as conducting individual in-depth interviews with the CEO and an external expert. The project is a preliminary stage preceding the main multiple case study research. Its implementation enables the clarification of concepts, research scope, identification of the most effective methods and techniques and minimalizing the risk of errors. The most important finding of the research is the necessity to conduct the main study in all selected companies within as short time as possible. The processes characterizing learning organizations, can disrupt the research. The pilot-study is still in the interpretation phase, therefore, during the conference, all conclusions transferred to the main research will be presented.

Keywords: corporate social responsibility, CSR, MedTech companies, strategic management, multiple case study

The research has been supported by a grant from the Faculty of Management and Social Communication under the Strategic Programme Excellence Initiative at Jagiellonian University.

CIRCULAR ECONOMY AS A STEP TOWARDS ECOLOGICAL CIVILIZATION

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According to the latest National Footprint and Biocapacity Accounts 2022 study by the Global Footprint Network, the world uses resources worth 1.75 planets per year (up from 1.7 Earths in 2021). The international community undertakes numerous actions aimed at both preventing the devastation of the natural environment and unfavorable climate change. There is an urgent need to move away from an unsustainable linear economy model towards a circular economy. The circular economy (CE) assumes the reintroduction of end-of-life materials into the economic cycle and the replacement of the concept of "end of life" with the principles of 9Rs. But is CE enough? The changes necessary to respond to global climate disruption and social injustice are so vast that they require a different form of human civilization based on ecological principles.

Such is the broadly understood ecological civilization, which includes a synthesis of economic, educational, political, agricultural and other social reforms towards achieving sustainable development. Ecological civilization describes a world where human societies (our economic systems, agriculture, education, production and consumption, etc.) aim to promote the overall well-being of people and the planet. It is a vision of a more balanced and just society; a world that works equally for everyone.

The presentation will discuss the development of the concept of ecological civilization and how CE helps China in its pursuit of ecological civilization.

Many environmentalists in the world have adopted the concept of ecological civilization independently of Chinese environmentalists and politicians. The concept of ecological civilization, although it originated in communist China and the USSR, was adopted by the global community of process philosophers.

Ecological civilization is often mentioned as the one that will follow industrial civilization.

Keywords: circular economy, ecological civilization

POSTER PRESENTATIONS

CIRCULAR ECONOMY AND WASTE MANAGEMENT

DESIGNING TRADITIONAL AND VEGAN CURD PRODUCTS WITH THE ADDITION OF CHOKEBERRY POMACE

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Sustainable production and consumption is a leading trend in science and economy. One of the current problems is the management of food waste, such as pomace from the production of fruit juices. Due to their high health-promoting value, e.g. high content of polyphenolic compounds, can be a valuable addition to various products, e.g. cheeses. In addition to traditional cheeses, consumers are increasingly interested in alternatives in the form of vegan, dairy-free products. Therefore both types of curd products were taken in the design of innovative cheeses enriched with chokeberry pomace.

In the presented study, chokeberry pomace obtained from chokeberry fruit using a low-speed juicer was used as an addition to create traditional and vegetarian curd. The research was carried out in several stages, including the development of cheese recipes in both traditional and vegan versions, preparation of pomace in dried and ground form, determination of the level of cheese additives, and evaluation of selected quality indicators. The main determinants of quality included microbiological safety and sensory properties of the prepared products.

Based on a series of attempts to design cow's milk cheeses and their non-dairy substitutes, recipes were developed. In the case of the vegan version, cashew nuts and millet were used in appropriately selected proportions so that the consistency and taste were as much as possible comparable to cow's milk cheese. Microbiological analyses showed the need for additional steps to eliminate contamination in vegan cheeses resulting from the use of nuts, however, finally the microbiological quality was satisfied. Sensory analyses revealed that the addition of pomace affected the sensory characteristics of the product.

Keywords: sustainable production, consumers trends, innovative products

EVALUATION OF QUALITY OF NOBLE METALS RECOVERY AND SEPARATION USING IONIC LIQUIDS

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In recent years, there is a notable increase in the interest in noble metals, especially precious metals (PMs), such as palladium(II), rhodium(III), gold(III) and platinum(IV) because of a wide range of their industrial applications. They are used as catalysts in organic technology processes, as value added components in metal alloys and as vehicle catalytic converter systems, in jewellery making and also in the chemical, pharmaceutical, petroleum and electronic industries. Recovery of precious metals from spent materials is very important to replenish a gap between the demand and the limited supply from natural resources. PMs have been classified as critical raw materials, thus a circular economy model should be implemented for their effective recovery. The perspective of recycling PGM from secondary resources is beneficial not only for the environment (less waste) but also for the economy. Recycling of waste materials, like electronic scraps or spent vehicle catalytic converter systems is perfectly legitimate, not only due to the impact that the ill-managed waste may have on the environment, but also because of its profitability in view of the possibility of recovery of valuable components, including precious metals.

Ionic liquids (ILs) are molecules, which consist of cation (the most common: ammonium, imidazolium, pyridinium, piperidinium or phosphonium cations) and an inorganic or organic anion. They are liquid at temperatures below 100ºC and indicate some unique properties, like negligible volatility, nonflammability and thermal stability. Their solubility in water, cloud point and viscosity depend on the cation and anion used. ILs are widely used as solvents or catalysts for organic reactions but recently they are increasingly used for noble metal ions separation both in adsorption, extraction and membrane processes.

Ionic liquid-assisted solvent extraction has shown excellent quality for precious metal (PM) extraction/separation from chloride solutions and therefore proved to be an alternative to the conventional method of separation. Metal extraction is very sensitive with the types of anions and cations incorporated to the ILs. Different mechanisms might be involved, which could be ion exchange, neutral extraction, split-anion mechanism, and combined ion exchange-neutral extraction.

Keywords: noble metals, ionic liquids, solvent extraction, quality of separation

SPENT AUTOMOTIVE CONVERTERS - VALUABLE SOURCES OF PGM

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The platinum group metals (PGMs) consist of six elements: rhodium, ruthenium, palladium, platinum, iridium, and osmium. These metals are used in such areas as catalysts, the chemical, pharmaceutical, petroleum and electronic industries. Platinum, palladium, and rhodium are particularly irreplaceable in automotive catalytic converters, which are used to treat exhaust gas. A three-way automotive catalytic converter it is considered to have between 3–7 g of platinum, 1.5–5.0 g of palladium and 0.8–1.5 g of rhodium. PGMs have been classified as critical raw materials (CRMs) in North America and Europe, thus a circular economy model should be implemented for their effective recovery. PGM recovery from primary ores is expensive, due to low concentrations of their ores (lower than 10 g/tn) and sophisticated processes implicated, while secondary resources have been proven technoeconomically feasible sources for PGM recycling. Secondary resources of PGMs, such as spent automotive converters, contain considerably higher PGM concentrations than their corresponding ores.

The world is transitioning away from fossil fuel vehicles and most countries plan to prohibit the sales of new fossil fuel vehicles by 2035. However, this process is slow and there will still be many fossil fuel vehicles in use until at least 2050. The recycling of spent automotive converters is a large industry that will continue for many years.

Recycling PGMs from spent automotive converters has the potential to yield significant economic and environmental benefits. It is estimated that spent automotive catalytic converters deliver more than 57% of PGMs' European supply, being considered a crucial resource for PGM recovery. Novel recovery techniques focus not only on high recovery rates, but also on cost efficiency and environmental protection. This paper reviews the main technologies for recycling PGMs from spent automotive converters, including metallurgical extraction and solution purification techniques.

Keywords: platinum group metals (PGM), spent automotive converters, recycling, leaching, hydrometallurgy

THE POSSIBILITY OF USING COMPOSITE WASTE TO ASPHALT

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In Europe there is a high potential for recycling waste in road construction. New roads would be made of target waste materials. Various types of waste materials for example glass, plastics, scrap tyres, ceramics have been successfully used in road pavements. Fibres and polymers are two important examples used for improve the engineering properties of the asphalt, so composite waste has potential for re-use in asphalt. Recycling composites represents a technological challenge, and little practical experience exists. The research focused on sustainable recycling of composite waste. Recycled composite waste applied to asphalt can considered one of choice to overcome such environmental problem by reducing the large quantities of such wastes. The research on the possibility of using glass polyester recyclate to modified bitumen was analysed. The influence of adding of glass reinforced polyester recyclate on the some properties of bitumen has been studied. The dynamic viscosity, penetration and softening points of the obtained modified bitumen were tested.

The addition of glass polyester recylate to bitumen resulted in an increase of dynamic viscosity and softening points of bitumen. It was also observed after adding glass polyester recyclate the decrease of bitumen penetration. However, glass polyester recyclate modified bitumen has very poor storage stability at high temperature. Improvement of the storage stability of glass polyester waste modified bitumen can be achieved by using compatibilizers.

Keywords: composite waste, recycling, asphalt

DESIGN AND MICROBIAL QUALITY ASSESSMENT OF FERMENTED BEVERAGES BASED ON WASTE FROM THE BAKERY INDUSTRY

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In response to today's environmental and social requirements, food producers are increasingly using a sustainable approach in production and product design. For this reason, it is becoming increasingly important to develop new products based on waste from the food industry and based on natural processes such as microbial fermentation. An example of such a solution is the use of waste from the baking industry (e.g. bread) and lactic acid bacteria to develop innovative, fermented beverages with potential probiotic properties.
The aim of the experiment was to design prototypes of fermented beverages based on wheat-rye bread waste and evaluation of microbiological quality during storage. Controlled fermentation of beverages was carried out with use of 4 strains of lactic acid bacteria (*L. plantarum*, *L. paracasei*, *L. rhamnosus* and *L. sakei*) at 30°C for 24 hours. After the fermentation process, the selected quality indicators including microbiological quality and pH value were evaluated. In the next stage of the experiment flavour variants of the obtained fermented beverages were prepared. Their microbiological stability and pH were determined after 24 h and 7 days of storage.
The obtained fermented bread beverages characterized a high number of lactic acid bacteria (in the range of 10^8 to 10^9 cfu/ml) and a low pH value (3.10 – 3.48) depending on the used bacterial strain. The prepared flavor variants, both after 24 h and 7 days of storage, were characterized by good microbiological parameters and acceptable flavor. The number of lactic acid bacteria remained at the level of 10^8-10^9 cfu/ml (depending on flavor variant), while the pH also showed low values (<3.6) and even decreased after 7 days of storage. In the tested beverages fungi (yeast and filamentous fungi), *Escherichia coli* and *Enterobacteriaceae* rods were not detected. The conducted research shows that the fermentation of waste from the baking industry (such as bread) and properly selected flavor additives can contribute to the creation of new innovative products with the desired quality attributes.

Keywords: sustainable production, zero waste approach, product design, product innovation, food safety, fermented beverages

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PROCESSING OF PLASTIC WASTE FROM AUTOMOTIVE INDUSTRY: MECHANICAL PROPERTIES–STRUCTURE RELATIONSHIPS

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Nowadays, the increasing number of vehicles is contributing to an increase in the amount of polymer materials in the overall waste stream after the end of their life cycle. Therefore, it is important to appropriately carry out the process of recycling, separation, and reuse of these materials to protect the environment and minimize the utilization of natural resources. These factors are in accordance with the circular economy model and the concept of sustainable development. Implementing these principles enables to minimize natural resource consumption and reduce our negative environmental impact. By using a circular economy, we can optimize resource utilization and minimize waste generation. The implementation of these factors is essential in achieving a more sustainable and balanced approach to economic growth and environmental protection.

The article presents the possibilities of processing polymer waste from the automotive industry to obtain composites with advantageous mechanical properties and structure. In order to optimize the technology of producing composites, two versions of technological solutions were used, for which standardized test samples were prepared for evaluating the quality of the produced polymer blends. The mechanical properties of the obtained composites, such as tensile modulus, tensile strength, and elongation at break, were evaluated in a static tensile test. Microscopic analysis of the surface structure of the fractures of the composites was also performed. On the basis of the obtained research results, it was concluded that the most beneficial mechanical characteristics are attributed to composites produced using the mixing technology with the application of a dispersing system of the roller type.

Keywords: circular economy, polymer waste, recycling, composite materials

FOOD WASTE MANAGEMENT – THE ROLE OF FERMENTATION IN THE SOLVING OF PROBLEM

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According to the literature data, about one-third of the global edible food (1.3 billion tons) is wasted annually, therefore food waste is regarded as a critical problem worldwide and the need to develop mechanisms for proper food waste management is underlined. Food waste can be reduced through the development of technologies useful in different parts of the food value chain, as well as through educational programs on consumer behaviour in the field of sustainable consumption. Taking into account technological solutions one of the interesting way to convert food waste is the use of the fermentation process, which is a valorization route with high application, high efficiency, and strong robustness. Moreover, a wide range of possible value-added products can be obtained by fermentation. In the last years, there is a great interest observed in use of fermentation as one of the waste management solutions. Therefore the aim of the presented study was the analysis of literature data on the possibility of using and interest in the fermentation process in waste management.

The literature analysis covered the last ten years (from 2013) and was conducted in Scopus databases with the following keywords “food AND waste AND fermentation” and “food AND waste AND management” searching in the article titles, abstracts and keywords. In the analysis, only research articles in the English language were included.

More than 440 articles were found based on the mentioned criteria. It is worth underlining that there is a clearly growing trend of increased interest in the use of fermentation not only as a technological process but also as a one of food waste management solution. Taking into account the subject area it could be stated that the majority of research is connected with environmental sciences, energy and chemical engineering. Above 6% of articles concern biochemistry, genetics and molecular biology as well as agricultural and biological sciences. The conducted analysis underline that food waste utilization is a multidisciplinary problem.

Keywords: sustainable food, circular economy, waste management, fermentation

THE USE OF DISPOSABLE PACKAGING IN THE ASPECT OF ENVIRONMENTAL PROTECTION IN THE ASSESSMENT OF CONSUMERS

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The article presents a scientific analysis of the impact of use of disposable packaging on environmental protection, taking into account ecological aspects and sustainable development. In the context of the negative impact of single-use packaging on the environment, its importance for the generation of the waste stream and greenhouse gas emissions during the production, transport and disposal process are highlighted. Degradation of ecosystems, pollution of water and soil, and threats to fauna and flora are also often pointed out.

The article discusses the challenges associated with reducing the amount of disposable packaging. These include, i.a. the lack of effective waste management mechanisms, the lack of innovation in environmentally friendly packaging, the difficulty of changing consumer behaviour and resistance from producers and consumers.

In connection with the above challenges, a consumer survey was carried out to identify the most important problems related to the use and management of disposable packaging by their users. As part of the interpretation of the results of the study, the need for an interdisciplinary approach, taking into account economic, social and environmental aspects, was indicated. Actions are proposed at various levels, such as consumer education and awareness-raising, investment in research and development of alternative packaging, development of recycling infrastructure and regulation.

The conclusions underline the importance of long-term strategies and action plans that take into account both consumer needs and environmental objectives. Attention was paid to the need to monitor and evaluate the effectiveness of the actions taken and the need for further scientific research towards improving the strategy and pro-environmental approach in the field of packaging and environmental protection.

Keywords: CSR, sustainable development, ecology, packaging

CONDITIONS FOR THE MANAGEMENT OF BY-PRODUCTS OF CHOKEBERRY FRUIT PROCESSING IN THE OPINION OF POLISH FOOD PRODUCERS

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For many years, research and work have been carried out on the possibilities of managing agricultural and food industry waste. One such direction is the production of high-quality food products with the use of such by-products. The approach used in the study to introduce a new product or group of products was design thinking. The first stage of such an approach is getting to know the user thoroughly (emphathisation). As part of empathizing, the focus was also on getting to know the opinion and experience of industry representatives on chokeberry pomace

The aim of the research was to determine key opportunities and problems related to the use of by-products of chokeberry fruit processing in the development of food products with additional functional features in relation to the examined industries.

To achieve the above-mentioned goal, conducting qualitative research using the Individual In-Depth-Interview (IDI) method and the categorised interview questionnaire research tool was chosen. The study was conducted among experts on fruit, including chokeberry processing and food processing waste management (N=10, targeted sampling) in Poland.

The identified problems are related to the lack of repeatability of raw material parameters including the amount of antioxidants and the need for proper storage conditions, and the possible impurities. The opportunities identified include, among others, a large amount of raw material, availability of domestic pomace, and potentially high value of the material (high in polyphenols).

Keywords: aronia, chokeberry by-products, chokeberry pomace, IDI, new products upcycling

This research has received funding from the 1st edition of the Inter-University Research Grants SGH-UEW-UEK-UEP-UEKat within the project entitled "Designing Innovative Food Products in the Process of a Sustainable Method of Reducing Fruit Processing Waste".

CONSUMER ATTITUDES TOWARDS ENVIRONMENTALLY FRIENDLY PRODUCTS AND THEIR PACKAGING

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Interest in environmentally friendly products is increasing and consumers are looking to protect the environment through their behaviour and purchases. Packaging has a major impact on air and soil pollution and accounts for half of marine litter. Despite increased recycling rates in the EU, the amount of waste generated is growing faster than actual recycling. Without EU recycling measures, the volume of plastic waste produced would increase by 46% in 2030 and by 61% by 2040 compared to 2018. The survey was carried out using a standardised structured questionnaire and focused on Slovak consumers. The survey was conducted between December 2020 and February 2021 and involved a total of 433 respondents. Mathematical and statistical methods were used to investigate the relationships between respondents' characteristics and their attitudes towards environmentally friendly products. Most respondents purchase environmentally friendly products in the food and drugstore product category, and respondents prefer recyclable and reusable packaging. Based on our findings, we can conclude that respondents care about the packaging of the product and try to consider the environment when making their choice. Most of the respondents perceive environmentally friendly products very well, and a statistically significant relationship between the income of the respondents and their attitude towards environmentally friendly products has been demonstrated. The most important factor for respondents when purchasing environmentally friendly products is the quality of the products. It is important for product manufacturers and sellers to ensure that environmentally friendly products are recognisable from conventional products. Packaging that is able to attract attention and clearly shows that it is an environmentally friendly product would increase product sales.

Keywords: environmentally friendly products, packaging, consumer behaviour

CONSUMER ATTITUDES TOWARDS FOOD WASTE

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Food loss and food waste (FLW) have substantial environmental, social and economic consequences. Nowadays, sustainably meeting the food demands of a growing population based on finite resources while protecting the environment is one of the great challenges. FLW affects food security and food nutrition, the sustainability of food systems and undermines the long-term resilience of the global food system by aggravating ecosystem damage. Food is an essential factor in SDGs: no poverty (SDG 1), zero hunger (SDG 2), good health and wellbeing (SDG 3), clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), responsible consumption and production (SDG 12), climate action (SDG 13) and life on land (SDG 15). Civilisation changes affect the attitudes of consumers related to food waste. Most food is wasted by households. The structure of wasted food products are comparable in different countries. The most wasted products are bread, vegetables, fruits, cold cuts and sausages.

The analysis of attitudes of individual groups of society directs actions to be taken in order to reduce food waste. Consumers are classified into different clusters. All studies identified a group of respondents who treated the problem of food waste disrespectfully. At the same time, in each study there was a group of “saving food” consumers. Other identified consumer segments are different, depending on the group studied and the methods of agglomeration used. In general, it can be stated that young people living in single and double households contribute to large amounts of food waste. Consumer awareness of food waste problem is increasing, especially among young people. Unfortunately, awareness does not correspond to consumer behaviour.

The purpose of this study is systematic review of clusters depending on the studied socio-demographic and other factors shaping consumer attitudes in relation to food waste.

Keywords: food waste, consumer attitudes, SDGs

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ANALYSIS OF TECHNOLOGICAL PROCESSES IN THE CONTEXT OF CARBON FOOTPRINT DETERMINING

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Circular economy is constant interaction of entire chain of entities and conscious taking of measures for environment. Great challenge is to meet the European Union's goals of becoming a climate-neutral area by 2050. Food production is a major contributor to greenhouse gas (GHG) emissions. Carbon Footprint (CF) is used to assess these emissions in food production. Identifying emissions and determining reduction directions is a complex issue and requires an interdisciplinary approach.

The purpose of research was to develop a methodology for food production CF analysis, using the example of flour production to develop national standards. The scope of work included technological process analysis and unit process diagrams preparation in production cycle. The issue analysis approach was presented as a research method. After characterizing technological processes, CF measurement ranges, functional unit and boundary of measurement system were determined. The inputs and outputs analysis within specified range and throughout life cycle was carried out. A method was developed for counting process CF and with an extension of the range to include ingredients CF. Process line metering conception feasible for CF calculation was planned. Relevant emissivity data were collected with production volumes and cycles number recording. Based on this, a database was created for calculating CF, depending on production volume.

It has been shown that for each production and product, a detailed analysis must be carried out and the CF calculation method must be adapted to specific needs, taking into account their characteristics. Appropriate CF analysis methods and universal metering systems are necessary to identify the individual steps responsible for GHG emissions in food production. CF reduction is possible by shortening supply chain, optimizing production equipment, modifying food technology and production planning.

Keywords: carbon footprint, food labeling, greenhouse gas emissions, Life Cycle Assessment, sustainable production

Research carried out within the framework of Task 4 "Analysis and methodology of carbon footprint measurement for selected technologies and agri-food products produced by the Polish food industry", funded by the Ministry of Agriculture and Rural Development (DRE.prz.070.2.2023).

POSTER PRESENTATIONS

CONSUMER BEHAVIOR AND PREFERENCES

BEVERAGE CONTAINER DEPOSIT RETURN SYSTEM FROM CONSUMERS POINT OF VIEW

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Until now, there are still many freely thrown plastic packaging in nature, on the streets, and on the waterways. As Europe continues on the road to circularity and carbon neutrality, every economic sector needs to contribute. The PET packaging industry has a clear objective in place to achieve 90% collection of PET bottles by 2029. These targets for recycled content drove a system change in the production and recycling of plastic bottles. Recycling PET saves more than 70% of energy and CO2 emissions. The Slovak Ministry of the Environment officially commissioned the Consortium of 4 associations of beverage producers and retailers, namely AVNM, to establish a central deposit return system administrator for Slovakia. Their members collectively represent almost 80 % of all container-made beverages placed on the market and more than 3,000 retail stores in Slovakia. The purpose of the article is to investigate the views and behaviour of Slovak consumers about the beverage container deposit return system. Primary data was obtained using the enquiry method, an electronic questionnaire. The survey was conducted in March 2023. One hundred and seven respondents participated in the survey (66% women and 34% men). Based on the survey we can say that consumers are actively involved in the beverage container deposit return system in Slovakia, prefer to return packaging in this way rather than having it sort, and think that introducing this system makes sense. Three-quarters of the respondents would prefer a store that is located in a machine for disposable return packages than other places, which can be seen as a competitive advantage for these retailers that have one. The respondents are not satisfied with the current disposable package return system due to the low number of places (shops) where the packaging return machines are located, the overcrowding of the machines, the frequent failure of these machines, the long queues at the machines and the need to carry used packaging to the store. As a major advantage, the respondents said that there will be less waste and pollution in nature and that they will help protect the environment.

Keywords: deposit return system, beverage packaging, consumer, Slovakia

THE INFLUENCE OF BRAND INFORMATION ON MILK CHOCOLATE ACCEPTANCE

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Chocolate is one of the most popular and beloved food products in the world. It is made from cocoa beans, which are subjected to fermentation, drying, roasting, grinding, and conching processes. Depending on the composition and method of production, various types of chocolate are distinguished, such as dark, milk, white, filled or drinking chocolate. Chocolate has many nutritional, taste and health properties, as well as evokes positive emotions and improves mood.

Consumer perception of a product involves a complex interplay of both cognitive and affective factors, often influenced by aspects such as price, quality, packaging, and brand. These perceptions, in turn, play a critical role in shaping consumer behavior and purchase decisions.

The aim of the study was to examine how brand information affects consumers' perceptions of milk chocolates, with a focus on both sensory and visual attributes. A two-stage sensory evaluation study was conducted with private label and leading market brand milk chocolates. The first stage aimed at understanding the desirable quality attributes of chocolates and assessing the acceptance levels concerning the optimally desired intensity of specific features. The second stage considered the effect of brand familiarity and packaging attractiveness on overall desirability. Overall, there were no significant differences between the blind liking scores (color, odor, taste and melt in the mouth) of private label and manufacturer brands of milk chocolates. However, brand information and familiarization with the samples packaging resulted in changes in the overall liking of chocolates.

Keywords: acceptance, brand, chocolate, packaging, private label, sensory quality

APPLICATIONS PREVENTING FOOD WASTE ACCORDING TO USERS' OPINION

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The food waste represents a problem of major social significance. In the context of the global food crisis and the growing problem of hunger spread worldwide, proper management and distribution of food products and the reduction of food loss and waste is essential to improve food security. This problem was reflected in the report "The State of Food Security and Nutrition in the World" published by the Food and Agriculture Organization of the United Nations in 2019. The report clearly indicates that the waste of food products is the result of decisions and actions taken by various economic entities, including consumers. Rational and responsible management of food products at all stages of the food chain requires a need for comprehensive and holistic approach. In recent years numerous increasingly popular initiatives, such as food sharing, 4P and zero waste have been implemented. The main aim of these projects is not only to reduce the amount of food wasted, but also to change the general approach to food consumption. An innovative and promising tools designed to reduce food mismanagement are internet apps, intended to prevent food waste, promote recycling and contribute to reduction of the amount of food waste generated on daily basis. It is apparent that the consumers` awareness toward food waste had noticeably increased, in particular their interest in ways to reduce and prevent this phenomenon. In particular two mobile apps, Too Good To Go and Foodsi, designed to allow consumers to purchase discounted food products received growing media attention in Poland.
The main focus of the consumer research using a survey questionnaire was to determine the attitude of potential consumers towards using mobile applications preventing food waste and the shopping preferences of the Foodsi and Too Good To Go apps users. The analysis of the obtained data showed that the respondents are aware of the existence of mobile applications allowing to purchase previously unsold food products at significantly lower prices. Furthermore, the findings suggest that the app users perceive it as a useful tool to prevent food waste.

Keywords: food waste, mobile application, Foodsi, Too Good To Go

THE ROLE OF QUALITY IN PURCHASE PROCESS OF DERMOCOSMETICS

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The aim of the work was to identify the determinants of purchasing decisions made by customers choosing dermocosmetics in a pharmacy instead of cosmetics in a drugstore, and to assess the impact of the perceived quality of these products on their choices.

The survey confirmed that the female respondents believe in higher efficacy of dermocosmetics in skin care, higher quality, lower content of potential allergens, and higher content of advanced active ingredients in their formulas. In addition, respondents choose dermocosmetics since they believe that there are no allergic reactions after their use. Moreover the most important determinants of choice of products in pharmacies by female consumers declaring that they purchase specific dermocosmetics, one can conclude that include the following: product features and properties, perceived product quality, habit/experience with the product, recommendation from a dermatologist/beautician, price and product brand. The survey conducted confirms the very important role of quality as a factor prompting them to choose a dermocosmetic instead a cosmetic and significance of the perceived quality of the product as a determinant of choosing a specific dermocosmetic in a pharmacy.

The conclusions of the research present a valuable indication for enterprises in terms of managing dermocosmetics-related quality. They may be particularly helpful to quality, R&D, legal regulations and marketing departments in terms of designing and placing on the market new products meeting quality and legal requirements as well as satisfying high expectations of consumers.

Keywords: quality, dermocosmetics, consumers' decisions, dermocosmetics market

OPINIONS OF CONSUMERS AND NUTRITIONISTS ON CONSUMPTION AND HEALTH PROPERTIES OF VEGETABLE SPROUTS

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Vegetable sprouts play an important role in human nutrition. They provide many essential nutrients such as vitamins A, B, C, E and H, unsaturated fatty acids, dietary fiber and amino acids. Regular consumption of them has a positive effect on the immunity of our body, slows down the aging process and prevents cancer. They also contain magnesium and potassium that improve well-being. Sprouts are a rich source of antioxidants, which by fighting free radicals prevent many dangerous diseases. They contain several times more vitamins and minerals than an adult plant and are low in calories. Several types of sprouts are available, and the right growing methods and conditions affect their quality and microbiological safety. In view of such premises, the purpose of this work was to prepare and conducting anonymous consumer surveys and interviews with producers of vegetable sprouts.

The analysis of data obtained on the basis of interviews proved that belonging to specific social groups and education have an impact on the eating habits of people from Poland. The studies showed a significant advantage in eating healthy meals among dieticians, while respondents with higher education had the greatest knowledge about the nutritional properties of vegetable sprouts. It is also interesting that women and men have a similar opinion about vegetable sprouts. According to representatives of both sexes, sunflower, lentil, beetroot and watercress sprouts are the most famous. Consumers show a general tendency to buy sprouts in hypermarkets, and in their choice they are guided primarily by the price. The results also indicate that consumers are familiar with both the positive and negative features of vegetable sprouts. The advantages commonly include their nutritional and health value as well as the ability to germinate quickly while being easy to cultivate. The indicated disadvantages include the susceptibility of the product to bacterial infections and the development of mold, as well as the possibility of heavy metal accumulation. On the basis of the answers obtained in the survey, it is concluded that vegetable sprouts are not a very popular food product. Their availability in stores and information about them in the media should be increased.

Keywords: consumers, cultivation methods, eating habits, food additive, health properties, influence of education, nutritional value, popularity of sprouts, quality, vegetable sprouts

ATTITUDES AND BEHAVIOR OF CONSUMERS ON THE NANOPRODUCTS MARKET

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The subject of the study was a group of 260 respondents diverse in terms of gender, age and education. The aim of the study was to examine the extent to which Polish society uses nanoproducts in everyday life, in what spheres of life and with what awareness. The opinion of consumers was examined using a survey questionnaire, which contained 16 questions.

Consumers rarely use food-related nano-products. 31% of respondents are not interested in food packaging containing nanoparticles. On the other hand, consumers are eager to use nano-products used in medicine and household. A large percentage of consumers feel anxious about the harmful effects of nano-products. A high percentage of respondents stated that nano-products have not been sufficiently tested in terms of safety. The information that the product contains nanoparticles generates a sense of insecurity in them. They also believe that such goods can have a detrimental effect on health and the environment. However, consumers are interested in a new group of products manufactured with the use of nanotechnology, and they place a lot of hope in them, mainly in the field of pharmacotherapy and cosmetology.

Keywords: consumer, nanoproducts, attitudes, behaviors

ANALYSIS OF PROPERTIES AND ACTIVITY OF SELECTED BATH ADDITIVES WITH THE ADDITION OF GOAT'S MILK

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Substances from which bath products are made are very often allergenic, therefore sensitive skin, which is prone to allergic changes, is not always able to avoid the negative effects of using such products. In this case, self-made products become a good alternative, which will contain only such ingredients that there will be no doubt that they are dangerous for the skin.
Goat's milk is rich in minerals and vitamins. It is one of the products with the highest amount of calcium in its composition. In addition to calcium, goat's milk also contains vitamins such as: C, D, E, B12, sodium, potassium, phosphorus, iron, zinc, selenium, PP, folic acid, copper and manganese. In the cosmetics industry, goat's milk is used in body, face and hair care products. Preparations based on this natural ingredient have a strong moisturizing and softening effect.

Research allowed to compare selected features of bath products prepared with the addition of goat's milk - ready-made and homemade products.
An organoleptic evaluation of such products was carried out, as well as an assessment of their functional properties, and consumers were asked for their opinion on the use and operation of such preparations. In addition, the bath products available on the market (their types and properties) were characterized, and the features of goat's milk and bath products with its addition were discussed.

Keywords: goat milk, bath cosmetics, useful properties, physicochemical properties, consumer preferences

THE ROLE OF BRAND STRENGTH IN CONSUMER ASSESSMENT OF THE PRODUCTS QUALITY

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A brand is a key element of a company's identity and at the same time the primary instrument for creating its image. Its task is to identify the product, producer or distributor, and its important role is that of differentiation and strength, which determine its competitive position in the market and recognition among customers. A customer who knows the brand trusts it and is more likely to buy it than a product they do not know, and is, therefore, able to pay more for a branded product.

The effectiveness of branding can be measured both by estimating the value of the brand and by estimating its strength understood as its influence on consumers' purchasing decisions. These assessments are most often performed using indirect methods based on the analysis of financial data, which results in the generalisation of the obtained results, making it difficult to assess the real strength of the brand concerning individual assortment groups or customer segments.

To assess brand strength in a more specific product group, the research involved hedonic consumer testing of women's cotton T-shirts of several brands available on the market. Two series of evaluations were performed for each product: in the first, coded samples were evaluated, while in the second, the evaluators were familiar with the brands of the evaluated products.

By comparing the results of the two series of tests, it was possible to obtain information about the real influence of the brand of the products on the sensory (consumer) evaluation of their quality and, therefore, on the purchasing decisions made.

The method used for assessing brand strength allows a relatively quick and cost-effective assessment of not only the strength of the brand but also a precise assessment of the strength of the brand in individual assortment segments, for different target groups as well as changes in brand strength over time, caused, for example, by ongoing marketing campaigns.

Keywords: brand strength, products quality, sensory analysis, consumer hedonic tests

ETHICAL ISSUES OF CONDUCTING NEUROSCIENTIFIC RESEARCH IN MARKETING AND MANAGEMENT

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This paper aims to identify and critically analyze selected ethical issues related to neuroscientific research used in marketing and management. Though prevalent criticisms of neuromarketing include unethical research practices, unethical applications of technology, and manipulations of consumers, yet, despite these criticisms, the volume of academic research in neuromarketing and related areas has grown steadily as does number of research and consulting firms worldwide. With the growth of the field, criticisms and doubts of neuromarketing's purported power also have grown. Some of these fears and doubts are not distinctive only of neuromarketing, because they do not involve any new controversy beyond that attributable to traditional marketing. It turns out that, most of the new ethical threats that are attributed to neuromarketing are unrealistic because powers are attributed to neuromarketing that are not really there. In fact, only a few ethical issues arise that is both distinctive and realistic. The commonly perceived potential ethical issues are fear that neuromarketing may render consumers' choices completely predictable and fear among consumers that neuromarketing can be used to influence their choices and decisions, putting them out of control via the brain's unique "buy button".

The paper focuses mainly on ethical aspects associated with introducing neuroscience into marketing research that are still waiting to be solved, such as observance of methodological rigor, transparency, quality certification and maintaining the privacy (medical data) of the tested persons.

In conclusion, we emphasize that it is possible to improve the credibility and trust in neuroscience research applied to both neuromarketing and neuromanagement, although no ethical concerns regarding neuromanagement have been raised in the literature so far.

Keywords: consumer neuroscience, ethics, neuromanagement, neuromarketing

POSTER PRESENTATIONS

DESIGN, QUALITY AND SAFETY OF FOOD AND NON-FOOD PRODUCTS

TESTING OF SURFACE PRIMERS FOR AUTOMOTIVE REFINISHING

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Automotive coatings have been used and developed since the early days of automotive industry – just after the turn of the Twentieth century. The automotive coatings market was valued at 15.0 billion USD in 2022 and is expected to grow. Automotive coatings have gone a long way since the early 1900s and new application methods as well as compounds used have been developed since. Novel coatings can produce durable surfaces that protect from extreme temperatures, UV radiation, or foreign particles. They are durable yet elastic, as they are applied to different surfaces like metal or plastic. Automotive coatings enhance vehicle's appearance and more importantly provide anticorrosion protection. They are used in new cars, but also for repairing and refurbishment of damaged vehicles. That's why the Original Equipment Manufacturer (OEM) market develops rapidly.

The coatings industry is considered a mature and stable segment of the global economy, and demand for coatings has followed overall economic activity. Nonetheless, the coronavirus outbreak has caused production to stall and a problem with raw material availability in 2020 and 2021. Solvent-based technologies accounted for the largest share of the global coatings market in 2021, but the solvent-based coatings segment is expected to grow slowly due to regulations on VOC emission levels. Choosing the right coating method depends on many factors, including environmental issues. The choice of the appropriate coating method is very important and should be made based on many factors, including: the purpose, the type of material and its properties, coating conditions and ecological and economic requirements. The basic division of the types of varnishes available includes organic solutions, aqueous solutions, aqueous dispersions, non-aqueous dispersions, non-dilutable systems so-called 100% and powder systems. The choice of application method will largely depend on the chosen coating product. It is not possible to apply non-solvent and powder systems using air spray, which means choosing a different coating method.

Vehicle refinishing is a process that involves the local repair of defects in the car's coating or the full upgrade of the vehicle by providing a more attractive coating. For the customer, the degree to which the colour of the repair matches the rest of the vehicle is the most visible sign of quality and is the most important goal a refinisher must achieve. Due to the prolonged life of OEM coatings, the number of colours is constantly increasing. Original coatings, different from those after car refinishing, are divided into three-layer and four-layer coatings. The renovation process begins with the preparation of the surface for further treatment. As the first stage, sheet metal work is usually performed. In this phase, dent knocking is labour-intensive process requiring a lot of manual work. Unfortunately, it is impossible to achieve a perfectly smooth surface, and the remaining irregularities are smoothed out with polyester putty. Due to the considerable labour involved, replacement parts such as doors, fenders, hoods, etc., are increasingly being used to avoid the need to knock out bumps.

The paper compares the physical and chemical properties of surface primers commonly used on the European market in the vehicle refinishing industry. The study included research on, mechanical and physical properties of each primer, as well as chemical composition analysis.

Keywords: coatings, automotive refinishing, OEM, VOC

THE INFLUENCE OF 3D PRINTING PARAMETERS ON THE MECHANICAL PROPERTIES OF THE PRINTED ELEMENTS

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Additive printing techniques have gained importance in recent years. Depending on the purpose of manufactured details, not only different printing methods are used, but also different materials. Thermoplastics, such as poly(lactic acid) (PLA), are the most commonly used materials. This material has acceptable mechanical properties and is biodegradable. The key area of using 3D printing is prototyping. In addition, it is used e.g., in the automotive industry, aviation, construction, education, the fashion industry and various fields of medicine.

There are many works in which the mechanical properties of prints obtained from plastics were tested. The influence of various parameters, such as the orientation of elements in the printer, layer thickness, infill density, infill pattern, printing speed, part geometry etc. on the mechanical properties of printouts was investigated.

The aim of this paper was to examine the effect of the type of infill and build orientation on the strength of obtained details. Poly(lactic acid) was used as a printing material.

Tensile strength (PN-EN ISO 527-1:1998), bending strength (PN-EN ISO 178:2003+A1:2005) and impact strength (PN-EN ISO 179-1:2004/A1:2006) were tested. The tested fittings were designed using the Freecad 0.20 program and were produced on the ZMorph VX 3D printer. The Voxelizer 3.0.0 program was used to select infill patterns, adjust the build orientation of printouts and generate G-code files. Statistical analysis of the results was performed using the Statistica 10 software. The obtained results confirm that the type of infill and build orientation affect the samples' tensile strength, bending strength, and impact strength. The Shore D hardness of the obtained samples was also tested.

Keywords: 3D printing, poly(lactic acid), mechanical properties

ANTIMICROBIAL AND ANTIBIOFILM ACTIVITY OF OREGANO EXTRACTS

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Microbiological hazards in the food chain are a significant problem in global food safety, leading to a decrease of their quality and posing a health risk for consumers. Bacteria such as *Salmonella* sp., *Escherichia coli* or *Listeria monocytogenes* may contaminate food at the stage of the production process, where the source of contamination may be raw materials as well as the production environment including water, air or surfaces. Fungi and their toxic metabolites may contaminate various products, mainly of agricultural origin, from cultivation in the field to food production. Currently, new methods of the control of microbiological hazards in the food chain are constantly being sought, in particular methods consistent with the concept of sustainable development. Essential oils and plant extracts are of great interest as compounds of disinfectants or green preservatives as a sustainable and environmentally friendly way for ensuring food safety.
The aim of the study was to evaluate antibacterial, antifungal and antibiofilm activity of oregano extracts obtained by: extraction in supercritical CO_2, extraction in a Soxhlet apparatus and extraction with water steam as well as commercial extracts. Biological activity was determined towards bacteria: *Salmonella* sp., *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus* and toxigenic fungi belonging to *Alternaria* and *Fusarium* genera.
The conducted research showed that tested plant extracts exhibited antibacterial and antibiofilm activity as well as inhibited the growth of selected filamentous fungi, however, the activity was strongly depended on the extraction method. The best results were noticed for CO_2 extracts. The obtained results confirm high antimicrobial potential of oregano plant extracts and the possibility of using it to control microbiological hazards in the food chain leading to the achievement of the environmental and safety goals of sustainable development.

Keywords: sustainable development, microbiological hazards, food chain, food safety

QUALITY OF PUMPKIN SEED TEMPEH AS A MEAT PRODUCTS SUBSTITUTE

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The technology of meat substitutes and high-protein plant-based foods is still a challenge for the food industry. Consumers are seeking new sources of protein and, at the same time, sensory attractive alternatives to meat products. Plant-based meat alternatives (PBMAs) have a very high consumer acceptance level compared to other meat alternatives like insects or cultured meat. Soy as the richest source of protein in the plant kingdom is one of the basic raw materials for the production of meat substitutes. The main limitation of the use of soybean is the fact that it is classified as an allergenic ingredient. Manufacturers are more likely to choose raw materials that do not require declaring the allergen content on the label. Pumpkin seeds can be an alternative raw material for the production of PBMAs to soy. They contain many valuable, health-promoting ingredients like phenolic compounds, tocopherols, phytoestrogens, cucurbitacins, phytosterols, unsaturated fatty acids and valuable minerals, while being a rich source of protein.

The main objective of this study was to determine the quality of pumpkin seed tempeh as a meat products substitute. The physical features and sensory analysis of tempeh produced from soybean and pumpkin seeds by using *Rhizopus oligosporus* were compared. Texture analysis was performed by cutting sample of fried tempeh using Warner-Bratzler type knife and Brookfield Texture CT3 10 kg analyser. Values of hardness, hardness work done, quantity of fractures and fracturability of the tempehs were recorded. Sensory analysis using quantitative descriptive analysis (QDA) was performed by 10 panel members. The descriptors for colour, aroma, taste and texture were determined based on the literature and expert recommendations. Moreover, the overall quality of the tempeh was also assessed. The sensory panel members were educated about the sensory evaluation of fried tempeh and meat product. 10-centimeter nonstructured line scales with labelled ends were applied. Based on the obtained results, radar plots of the tested samples were created. Sensory and instrumental analysis results were compared. The conducted research allowed to conclude that pumpkin seeds can be an alternative raw material for soybean in the production of tempeh as a meat substitute.

Keywords: food quality, meat substitutes, plant-based food, pumpkin seeds, sustainable consumption, tempeh

THE INFLUENCE OF AZELAIC, SUCCINIC AND GALLIC ACIDS ON THE IRRITATING POTENTIAL OF SHOWER GELS

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Ease of use and versatility make shower gels the most popular group of body wash products in liquid form. It is assumed that, in addition to the basic cleansing function, they should moisturize, soften, lubricate and condition the skin and at the same time be easily rinsed off.

Body wash products typically use surfactants in concentrations of 10-20%. Such a significant share of surfactants in the composition correlates with the occurrence of skin irritation. It is believed that the formation of irritation is correlated with the interaction of surfactants with proteins present on the surface of the stratum corneum. Another mechanism points to the ability of surfactants to dissolve lipids and their derivatives and then remove them from the skin. Nowadays, the challenge is to improve the quality of personal hygiene products, including body wash products, manifested by their lower irritating potential. This goal is most often attempted to be achieved by introducing plant extracts or active substances into the composition.

Acne is a chronic skin disease, which is manifested by increased production of sebum by the sebaceous glands, the growth of *Cutibacterium acnes* around follicles, changes in keratinization and inflammation. Due to their anti-inflammatory and antimicrobial properties, azelaic, gallic and succinic acids are used in anti-acne cosmetics, including those intended for skin cleansing treatments. In this study, an attempt was made to determine the effect of azelaic acid, succinic acid and gallic acid on the irritating potential of standard shower gels. The skin irritation potential was determined on the basis of determination of the zein value and determination of the increase in the pH level of the bovine serum albumin (BSA) solution. This paper also attempts to determine the effect of azelaic, succinic and gallic acids on the surface and wetting properties of model products.

Keywords: body wash cosmetics, cosmetics safety, quality of personal care products

EFFECT OF BLENDING ON PHYSICAL AND NUTRITIONAL PROPERTIES OF OILS

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Quality, stability and nutritional features of oils are the most important factors in food technology and nutrition. Their stability during storage and heating is affected mostly by their composition. Most vegetable oils have limited application in their original forms because of their different properties, especially fatty acids composition and natural antioxidant content. The major problem affecting edible oils is lipid oxidation, changing their chemical, sensory and nutritional properties, causes the quality deterioration. The products of lipid oxidation are nowadays recognized as health hazards associated with aging, heart diseases and cancer. One of the possible solutions to increase stability and improve quality is designing the composition of oils by blending. Blending different oils is one of the simplest, physical method to create new and specific product with desired composition and characteristic.

The hypothesis of this work is that blending oils with high saturated fatty acids content will improve stability and prolong the shelf-life of highly unsaturated oils, but will not significantly affect their nutritional properties. Therefore, the objective of this study was to determine changes during thermal processing and storage of oils and their blends. Coconut, sunflower and rapeseed oil were used to create blends with different properties. Fatty acids composition, peroxide value and hexanal content were determined, as typical nutritional quality and oxidative stability parameters.

Keywords: blending, vegetable oil, stability, quality

THE ROLE OF MANUKA HONEY IN SHAPING THE QUALITY OF BODY LOTIONS FOR DRY SKIN

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Manuka honey has gained immense popularity in recent years. It is produced by bees from the nectar of the flowers of the manuka bush. This plant is exotic and comes from the eastern coast of the islands of New Zealand and the south-eastern part of Australia. It is well known primarily on the food market. Analysis of the composition of manuka honey (INCI Name: *Leptospermum scoparium mel*) contributed to an attempt to develop cosmetic recipes with this ingredient and to assess the quality of the obtained preparations.

The study analyzed the effect of manuka honey addition on selected quality parameters of body lotions intended for dry skin. For this purpose, 4 prototypes of body lotions were developed, differing in the mass ratio of beeswax to manuka honey (4:0; 3.8:0.2; 3.6:0.4; 3.4:0.6). The following tests were performed for all body lotions: stability, yield point, texture analysis and tests to determine the effect on the skin, i.e. measurement of the degree of hydration and transepidermal water loss from the epidermis. A consumer evaluation of sensory attractiveness was also made for prototypes of body lotions for dry skin. The influence of the concentration of manuka honey on the yield point of the body lotions was found. It was established on the basis of the yield point tests that the body lotion with the beeswax to manuka honey in the mass ratio of 3.8:0.2 had the highest value, and the reference preparation had the lowest value. These results corresponded with the results obtained in the study of hardness and adhesion strength. After application of body lotions containing manuka honey, an increase in skin hydration and a decrease in transepidermal water loss were observed. The highest number of points scored in the consumer assessment of sensory attractiveness was achieved by a body lotion with a mass ratio of beeswax to manuka honey of 3.8:0.2.

Keywords: body lotions, cosmetics, dry skin, manuka honey, quality

THE EFFECT OF SOLVENT TYPE ON THE USAGE PROPERTIES OF HAND CLEANERS

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The article evaluates the effect of the type of solvent on the performance properties of modern hand cleaners for heavily soiled. Formulations in the form of emulsions containing as hydrophobic solvents were developed: strawberry seed oil, blackberry seed oil, methyl esters of fatty acids obtained on the basis of rapeseed oil. On the basis of available literature data and own research, formulations were developed for 12 prototypes of hand cleaners containing 10, 12, 14, 16 % by weight denied additives. The following were evaluated for the made products: stability, pH, viscosity, flow limit of the degree of skin hydration, transepidermal water loss (TEWL), dirt removal efficiency.

The obtained test results were related to those obtained for two commercial products. Application tests proved that the highest dirt-removing efficiency was characteristic of preparations containing in their composition rapeseed oil methyl esters in concentrations of 14 and 16 % by weight. After washing off with water, they lubricated the skin, preventing it from drying out. On the other hand, an increase in the concentration of esters in the emulsions resulted in a decrease in the value of the yield stress, which had a beneficial effect on dispensing and spreading it on the skin surface. The addition of strawberry seed oils at concentrations of 14 and 16 by weight provided good removal efficiency relative to the commercial product, but caused a significant increase in viscosity values and yield stress relative to ester formulations and commercial products, resulting in poorer application properties. On the basis of the study, it can be concluded that the original formulations obtained were stable, had more favorable application properties relative to their market counterparts, and exhibited a skin care effect.

Keywords: handwashing agents, quality, solvents

THE INFLUENCE OF ANIONIC AND NONIONIC SURFACTANTS ON THE USAGE PROPERTIES OF HEAVY DUTY CLEANERS

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The article evaluates the effect of the anionic and nonionic surfactants on the performance of modern agents for removing tough dirt from surfaces. Formulations were developed in the form of emulsions containing fatty acid methyl esters derived from rapeseed oil as hydrophobic solvent. Anionic surfactants triethanolamine oleate, sodium oleate, and non-ionic surfactants sorbitan monolaurate, lauryl alcohol ethoxylated with 7 moles of ethylene oxide were introduced into the formulations. On the basis of available literature data and own research, formulations of 14 prototypes of hard surface cleaners containing anionic surfactants in concentrations of 16, 18, 20, 22 % by weight and non-ionic surfactants in concentrations of 8, 10, 12 % by weight in the formulation were developed. The following were evaluated for the made products: stability, viscosity, water solubility, efficiency of application and distribution over the cleaned surface, dirt removal efficiency. The obtained test results were related to those obtained for two commercial products.

The formulations developed were stable, no changes were observed in the appearance of samples stored for a period of 6 months. The tests of usage properties allow us to conclude that the highest efficiency of dirt removal from cleaned surfaces, were characterized by preparations containing in their composition 22% by weight of sodium oleate and 12% by weight of ethylated lauryl alcohol. For these samples, optimal viscosity, water solubility and efficiency of spreading the formulation on the surface were obtained, comparable to their commercial counterparts.

Keywords: heavy duty cleaner, quality, anionic surfactants, nonionic surfactants

COMMERCIAL AND SPONTANEOUSLY FERMENTED KIMCHI – MICROBIAL QUALITY AND ANTIMICROBIAL PROPERTIES

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Kimchi is a traditional Korean food consisting of fermented vegetables. Nowadays, due to its organoleptic, beneficial, and nutritional properties kimchi is a very popular appetizer, an important part of many meals, and also a base for preparing other dishes. Kimchi is particularly valued for its health-promoting and anti-bacterial effects. This high-fiber product contains B vitamins as well as various minerals such as magnesium, potassium and phosphorus.
The study aimed to determine the microbiological quality of commercial and spontaneously fermented kimchi. Kimchi were prepared according to the two different recipes. The antimicrobial properties of kimchi samples were determined against gram-positive bacteria of the species: *Bacillus subtilis, Micrococcus luteus, Listeria monocytogenes, Staphylococcus saprophyticus, Staphylococcus aureus*, and gram-negative bacteria of the species: *Escherichia coli, Pseudomonas putida*, *Salmonella* enteritidis and *Serratia marcescens;* as well as yeast *Rhodotorula mucilaginosa*. Identification of selected isolates from spontaneous fermented kimchi samples was also performed.
Microbiological quality was examined by the classic Koch plate method using multiplication and selective-differentiation media. Antimicrobial properties were determined by the agar well diffusion assay. Isolation and identification of selected isolates from prepared kimchi samples was based on macro- and microscopic evaluation and identification at the species level by MALDI-TOF mass spectrometry.
The microbiological quality of the tested kimchi samples, both commercial and prepared was at a very good level as no pathogenic microorganisms, as *Escherichia coli,* were observed. Moreover, a lack of filamentous fungi and yeasts was reported. The fermentation process contributed to a high growth of lactic acid bacteria and furthermore, a strong antimicrobial effect of kimchi was noted. Tested samples of kimchi inhibited the growth of indicator microorganisms to varying degrees, depending on the sample and the microorganism tested. The isolated microorganisms belonged to lactic acid fermentation bacteria and fermentative yeasts playing a significant role in a fermentation process as well as responsible for the functional and health-promoting properties.
Fermentation of vegetables with lactic acid bacteria ensures not only the sensory qualities of kimchi's taste but also its high microbiological quality that determines the product's stability and antimicrobial properties. Overall, the obtained results indicate that the composition of kimchi affects the fermentation process, and therefore its properties.

Keywords: antimicrobial properties, fermentation, food chain, food safety, kimchi, lactic acid bacteria, microbiological quality

STUDY AND EVALUATION OF THE POSSIBILITY OF USING PLANT AND FRUIT POWDERS AS PIGMENTS IN MAKEUP COSMETICS

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Currently, there is a tendency in the cosmetics industry to reduce or exclude synthetic substances by replacing them with natural substances of plant origin. Already at the initial stages of creating a cosmetic recipe, you can choose the source and production method or focus on the degree of biodegradability and toxicity to aquatic organisms, which provides great opportunities to influence sustainable development. Such a reduction in the content of synthetic ingredients and other unnecessary ingredients is the future of the quality of many industrial products, which brings not only an increase in consumer satisfaction but also a significant reduction in economic costs. This type of cosmetic preparations with a balanced composition, based on natural raw materials and vegan are becoming more and more popular among consumers. More and more often, makeup cosmetics recipes are created on the basis of substances of plant origin, which, in addition to their care properties, also have beautifying functions. Makeup is intended to give attractive depth and emphasize beauty. The difficult choice among hundreds of color makeup cosmetics is determined by features such as ease of application, coverage, water resistance, and color durability. The aim of the study was whether plant and fruit powders could be an alternative source of natural dyes. In the first stage of the research, the composition of a make-up cosmetic containing an extract obtained from selected fruits in powder form was developed. The functional properties of the obtained products were examined and the results were compared with the quality tests of products available on the market.

Keywords: powder pigments, plant, and fruit powders, makeup cosmetics, zero waste, sustainable development

THE INFLUENCE OF SELECTED FACTORS ON SHAPING THE QUALITY OF THE KASHUBIAN STRAWBERRY

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Strawberries are one of the favourite seasonal fruits in Poland and across Europe. These fruits are valued especially for their exceptional palatability. They are characterized by low calorific value, low glycemic index and other health benefits. Strawberries owe these unique health and sensory properties to numerous bioactive compounds, such as flavonoids, vitamins and dietary fibre. The present article focuses on the factors shaping the quality of strawberries, with particular emphasis on strawberries grown in the northern part of the Polish called Kashubia. Three varieties of strawberries are popular in this area: Elsanta, Honeoye and Senga Sengana, and they are called Kashubian strawberries. The first two varieties are intended for direct consumption, while Senga Sengana goes mainly to processing. Kashubian strawberry is a recognized regional and traditional product. Its quality is influenced by factors such as variety, climatic, soil and cultivation conditions, as well as agrotechnical treatments. The article shortly reviews available Polish and foreign literature. In the light of the research results obtained thus far, Polish strawberries, compared to strawberries from other growing regions, are characterized by a higher content of vitamin C, dry matter and palatability.

Keywords: Kashubian strawberries, quality determining factors, varieties, cultivation conditions, climatic and soil factors, harvest period and conditions

SHAPING THE QUALITY OF COSMETIC OILS FOR ATOPIC SKIN CARE

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Atopic dermatitis (AD) is an inflammatory disease with a chronic relapsing course. According to the World Health Organization (WHO), it is now the most common dermatosis in the world. In AD, there is a defect in the functioning of the natural skin barrier, associated with increased transepidermal water loss. Dryness, intense itching and inflammation of the skin are characteristic features occurring in AD. The basic element of atopic skin care is the restoration of the epidermal barrier, involving the use of appropriate cosmetic and therapeutic preparations. However, regardless of the treatment methods used, the skin care process is an essential element. The key raw materials used in skin care formulations for atopic skin are emollients with occlusive properties, causing the formation of a thin protective film on the surface of the epidermis, protecting against excessive evaporation of water from the deeper layers of the skin.

In this study, an attempt was made to develop three-component formulations of cosmetic oils in gel form. It was assumed that the formulations would be selected in such a way that they would contribute to the alleviation of undesirable symptoms of atopic dermatitis, in particular sensory hypersensitivity. Six ingredients acting as viscosity modifiers in the formulations (Hydrogenated Vegetable Oil, Silica, Aluminum Stearate, Zinc Stearate, Cera Alba and Cera Microcristallina) and three vegetable oils (Helianthus Annuus (Sunflower) Seed Oil, Vitis Vinifera (Grape) Seed Oil and Prunus Amygdalus Dulcis (Sweet Almond) Oil) were selected for the study. The effect of the type of rheology modifier and vegetable oil on the usable and physicochemical properties of the oils in gel form was demonstrated. It was found that the most favorable properties were characterized by the oil in gel form containing hydrogenated vegetable oil at a concentration of 5 wt.% as a rheology modifier.

Keywords: atopic dermatitis, cosmetic oils, quality, rheology modifiers, vegetable oils

QUALITY EVALUATION OF FACIAL CLEANSING GELS WITH SURFACTIN-RICH DIGESTATE SOLVENT EXTRACT. PART II – SAFETY OF USE

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This part of the work presents the results of a study on the evaluation of the quality of prototypes of facial cleansing gels using surfactin-rich digestate extract, in terms of safety of use. The assessment was performed for cosmetics in which the raw material of biotechnological origin was used in concentrations of 20; 40 and 80% by weight. Studies related to the safety of cosmetics in terms of their irritant and drying effects were performed, including zein number determination and bovine albumin test. A study of the ability to emulsify hydrophobic dirt was also conducted. The results were compared and contrasted with those obtained for the reference composition, which was a gel prototype not containing digest extract.
The zein number values determined for the facial wash gel prototypes indicated that all the cosmetic compositions produced did not revealed skin irritation. It was observed that as the concentration of the extract in the sample increased, the zein number value decreased. The results were confirmed in a test with bovine albumin, in which the same findings were obtained. Thus, it was shown that by replacing water, which is the solvent in the cleansing gel, with the digestate extract, the irritating effect of the cosmetic was reduced in terms of its interaction with epidermal proteins.
In the study of evaluating the ability of cosmetic prototypes to emulsify fats, an increase in the mass of hydrophobic substance possible to emulsify was observed with an increase in the concentration of the digestate extract in the samples. This was probably the result of the introduction of an additional ingredient into the composition that showed surface activity - surfactin. Thus, the introduction of the extract may guarantee an improvement in the efficiency of the washing process of the cleansing cosmetic, since emulsification of fatty soiling is one of its key elements. On the other hand, excessive emulsification of fats can contribute to excessive removal of valuable lipids from the epidermis, resulting in considerable drying of the skin after the washing process.

Keywords: cosmetics, extract, safety, skin irritation, quality.

THE EFFECT OF OZONATION ON THE MICROFLORA OF EDIBLE FLOWERS

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Edible flowers are extremely perishable products. Storing edible flowers may lead to significant growth of microflora, making them unsuitable for safe consumption. Due to the lack of possibility of interfering in the process of flower cultivation, our work focused only on the processes from harvesting to the delivery to the consumer. The aim of this study was to evaluate the effect of ozonation on the microbial quality of edible flowers including marigolds, pansies, and daisies.

Unpackaged flowers and flowers in packages (PET boxes) immediately after harvesting were ozonated with ozone at a concentration of 1 and 3 ppm The presence of the following microorganisms were determined on the flowers using the pour-plate technique: the number of yeasts and moulds, the number of *Staphylococcus aureus* (*S. aureus*) and the number of *Escherichia coli* (*E. coli*).

The results showed that all flowers were contaminated with yeast and moulds at counts 2.7-6.03 log cfu/g and 2.48-4.18 log cfu/g respectively, while only pansies and daisies were contaminated with *Escherichia coli* at counts ranging from 1.5 to 3 log cfu/g. All the tested flowers also contained *Staphylococcus aureus* at numbers ranging from 2.08 to 3.07 log cfu/g. The differences in the counts of *E. Coli*, moulds, yeasts and *S. aureus* were statistically significant depending on the type of flower. Ozonation did not significantly affect the degree of microbiological contamination.

Keywords: edible flowers, microbial quality, ozonation

NON-DESTRUCTIVE PREDICTION OF SENSORY QUALITIES IN STRAWBERRIES USING NEAR-INFRARED SPECTROSCOPY

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Strawberry fruit sweetness and acidity are important drivers of consumer acceptance. They are conventionally determined by expert panel using time- and cost-consuming methods. The aim of this study was to develop and optimize the calibration models for the prediction of sweet and acid flavours of strawberries from the spectra of intact fruit. The strawberries (*Fragaria×ananassa* Duch.) from two varieties including Rumba (48 samples) and Florence (48 samples) were studied. Near-infrared (NIR) spectra were performed directly on different parts of intact fruit using diffuse reflectance technique. The intensities of sweet and acid flavours of the same strawberry samples were assessed by trained sensory panel on an unstructured 10 cm line scale with labelled end points from "imperceptible" to "very intensive". In order to quantitatively evaluate the relationship between NIR spectra and sensory parameters the partial least squares (PLS) regression was used. Different methods of pre-processing were tested for model optimization.

The intensities of sensory attributes of strawberries studied varied in the wide range. The intensity of sweet flavour was in the rage of 0.2-10.0, with mean value of 4.7±2.4, whereas the intensity of acid flavour was determined in the range from 0.0 to 9.3, with mean value of 4.3±2.3. The mean values for two cultivars did not differ significantly (p<0.05). The model for sweetness prediction developed on the basis of spectra transformed using the standard normal variate (SNV) method was characterized by the best predictive ability. The obtained results demonstrated the potential of NIR spectroscopy for prediction the sweet flavour of strawberry. Non-destructive methods for assessing the properties of fruits are being developed for use in e.g. sorting, storage management as well as a part of decision making in harvesting systems.

Keywords: strawberry, sensory, NIR spectroscopy, non-destructive evaluation, PLS regression

QUALITY ASSESSMENT OF GREEN TEA USING NIR SPECTROSCOPY

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Tea is consumed all over the world and is considered one of the most popular beverages, right after water and coffee. The aim of this study was to evaluate the quality of green teas using near-infrared spectroscopy coupled with chemometric data analysis. For the study, 17 samples of green teas differing in processing method, harvesting time and geographic origin was used. The samples came from 4 countries: China, Vietnam, Japan and South Korea. All of them were purchased in a Polish online store. The research was carried out in terms of: analysis of NIR spectra of dried and infused teas, total phenolic compounds in infusions (using Folin-Ciocalteu reagent), and analysis of PCA and PLS data

NIR spectra were performed in the range of 12500-4000cm^{-1} for samples in the form of dried teas and prepared infusions. Based on the spectra obtained, characteristic absorption bands were analysed and assigned to the respective compounds. Principal component analysis (PCA) was used to group the dried tea samples according to their geographical origin, while partial least square regression (PLS) was used to check the correlation of the NIR spectra of the infusions with total phenolic compounds.

According to obtained results of all PLS analyses, it can be concluded that a good correlation between NIR spectra and total phenolic compound content was obtained. This is evidenced by the relatively high values of R^2 and the relatively low values of RMSEE and RMSECV. The quality of the model was determined by the RPD value.

Based on the results obtained, it can be concluded that NIR spectroscopy is suitable for assessing the quality of green tea.

Keywords: quality, spectroscopy, NIR, tea

POSTER PRESENTATIONS

INNOVATIVE PRODUCTS, MATERIALS AND TECHNOLOGIES

THE EFFECT OF OTILONIUM BROMIDE ON QUALITY OF HUMAN LIFE

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Irritable bowel syndrome is a condition characterized by chronic, recurrent intestinal dysfunction with cyclical periods with bothersome symptoms, leading to short or long treatments. The frequency of patients with irritable bowel syndrome is assessed at around 11.5% of the European total population. Otilonium bromide is used as an intestinal antispasmodic in the treatment of such disease. This compound belongs to family of quaternary ammonium derivatives. Otilonium bromide influences the motility of the large intestine and the contractility of smooth muscle cells in the colon. Understanding the precise mechanism of action of otilonium bromide is of great importance. The pharmaceutical has little systemic absorption and does not penetrate the nervous system, making it a potentially safe compound. The drug's action is based on the inhibition of L-type and T-type calcium channels.

Several successful therapies with otilonium bromide and placebo have been conducted worldwide. These clinical trials have proven safe and effective in patients with irritable bowel syndrome. The drug reduces abdominal pain, boiling sensation and relieves discomfort better than placebo. Studies have shown that treatment with otilonium bromide improves quality of life. Irritable bowel syndrome symptoms are recurring in up to one half of patients. For this reason, it is necessary to treat the disease periodically. In addition to treatment, it is also important for patients to take care of themselves by attending therapy, meditation sessions, managing stress through exercise, following a diet and attending a support group. It is crucial to continue to improve our understanding of the disease, educate patients and loved ones about the disease, and to find more and more new approaches and therapies.

Keywords: cationic surfactants, drug, irritable bowel syndrome, otilonium bromide, quality of life

POSSIBILITIES OF EXPANDING THE RANGE OF PUREE PRODUCTS RECEIVED FROM SUPERFRUITS

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The aim of study was to determine selected quality parameters (mineral compounds biologically active compounds, vitamin C) of purées obtained from superfruits, and then, to indicate fruit purées that have the greatest health-promoting properties and in the future may be the basis for expanding the range of these products.

The research material consisted of purées obtained from actinidia, cornelian cherry, haskap, elderberry, blueberry, sea buckthorn and cherry silverberry, originating from the region of north-eastern Poland. The fruits, were harvested in the 2022 growing season, washed and frozen for 6 months. After thawing, the fruit was parboiled, rubbed, homogenized, heated and pasteurized. The quality of purées was determined on the basis of: dry matter content (AOAC method), mineral compound composition (atomic absorption spectrometry), polyphenols (using Folin-Ciocalteu reagent), flavonoids (with aluminium-chloride method), antioxidant activity (DPPH method), vitamin C content (spectrophotometrically).

It was found that among the tested semi-finished products, elderberry puree was distinguished by the highest total content of minerals, of which it was the best source of potassium, iron and magnesium. Between the other tested products, cornelian cherry puree, containing a significant amount of potassium, phosphorus and zinc, and actinidia puree, characterized by a high content of calcium and copper, stood out in terms of the content of individual minerals. The highest content of total polyphenols and flavonoids was found in purees obtained from fruits, respectively: elderberry and haskap, as well as elderberry, purple actinidia and haskap, while the highest antioxidant activity was found in extracts obtained from cornelian cherry, haskap and elderberry.

The results of this study showed that purées from fruits are an attractive product, rich for biologically active substances and can be used more in food industry and gastronomy. These products can be also attractive for consumers due to the health benefits.

Keywords: superfruits, purées, quality, biologically active substances, health-promoting properties

THE EFFECT OF MODIFICATION WITH RECYCLED FIBERS ON THE PROPERTIES OF THREE-PLY CORRUGATED BOARD

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Corrugated cardboard is currently one of the most popular packaging materials in the world. The reason for the ever-growing demand for this material is its many benefits, such as low cost of products, being a completely biodegradable and environmentally friendly material, the possibility of modifying the composition with recycled fibers, the possibility of repeated use, and good functional and strength properties, which allow for a wide industrial application, especially for the production of packaging. In addition, due to the fact that cardboard is a paper product, it perfectly fits into the current pro-ecological trends, including the assumptions of sustainable development and the circular economy model.

This paper presents research on the effect of modifying three-ply corrugated board with recycled fibers on its physicochemical and strength properties. The aim of the research was to show the differences in selected properties of corrugated board resulting from the use of modified paper in one of the layers, and two layers were identical in the samples. Many experiments have been carried out on property testing, including organoleptic evaluation, determination of moisture content of paper and board, total thickness of board and individual plies, apparent density, grammage, flute height, flute pitch, corrugation coefficient, water absorption using the Cobb method, and strength tests such as bursting strength and edge crush strength of cardboard. The research results showed similar values of grammage, thickness, apparent density, corrugation coefficient, and flute pitch. All samples had an acceptable moisture level of 6 - 9%, so they can be classified as a compliant finished product or semi-finished product for further production, e.g., packaging. In another case, it was shown that the KS/WB/T3 board (containing primary and recycled fibers) achieved a higher linear water absorption of 16.8 g/m^2 than the T3/WB/T3 board (containing only recycled fibers) of 14.7 g/m^2. In tests of edge crushing and bursting strength, higher values were obtained by KS/WB/T3 (4.8 kN/m, 537 kPa) compared to T3/WB/T3 (4.36 kN/m, 440 kPa). Summing up, it was found that the KS/WB/T3 board had better strength properties, which may translate into wider use in many industries, including transport and storage.

Keywords: three-ply corrugated board, primary and recycled fibers, paper, cardboard quality, functional and strength properties

THE KINETICS OF HYDROLYTIC DEGRADATION OF 3D PRINTED PLA STRUCTURES UNDER THERMALLY ACCELERATED REGIME

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Since the management of plastic waste is among some of the biggest challenges the world faces today, one of the solutions calls for the usage of biodegradable materials. Bioplastics are a steadily developing branch of the polymer industry with the most prominent example being polylactide (PLA). Not only does it have mechanical properties comparable to commonly used polymers, but it can also be degraded through hydrolysis and further decomposed by microorganisms. Polylactide is hoped to contribute significantly to the reduction of the general waste stream, as well as reinforcing the idea of a circular economy.

PLA has mainly found commercial application as a filament utilised in fused deposition modeling (FDA), both for rapid prototyping and the creation of custom parts. The study's main focus is decomposition of 3D-printed samples made of polylactide – more precisely, the kinetics of hydrolitic degradation under a thermally accelerated regime.

Changes in the structure of the degrading samples were investigated at different scale levels to create complementary sets of data that made it possible to gain insight into the process of PLA decomposition and expand the knowledge of biodegradation. Firstly, the mass erosion measurement and photographic documentation are conducted to provided information about the general stage of degradation. The main part of the study was the measurement of the intrinsic viscosity of samples dissolved in the dichloromethane, the parameter that is closely linked to the molecular weight of the polymer.

The obtained results clearly presented a rapid structural transformation of 3D printed materials during its degradation, realized under thermally accelerated hydrolysis regime, due to their amorphous initial structure, together with substantial changes in mechanical properties and the decrease in the molecular weight.

Keywords: 3D printing, hydrolytic degradation, intrinsic viscosity, kinetics, mass erosion, polylactide, thermal degradation

INFLUENCE OF THE RUBBER BASE IN THE RUBBER COMPOUND ON THE PHYSICO-MECHANICAL PROPERTIES

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A rubber compound is a mixture of synthetic or natural rubber, fillers and additives that modify its properties. The properties introduced into the rubber by many factors, including the type of rubber, its amount, type of filler and additives. The selection of rubber varieties is crucial to obtain the desired product property.
Problem undertaken in the work was the analysis of the impact of the rubber base on the physical and mechanical properties of rubber mixtures, using these auxiliary substances in the original amount and the same method of production. In addition to the base under examination, four criteria are evaluated by the use of other rubbers (isoprene, butadiene-styrene) or changes in their properties.

Experiments done made it possible to determine the impact of the rubber base on the physical and mechanical properties of regulated rubber compounds. The tested components, thanks to the modification of the rubber base, can be improved in this category of exemplary assessment, and at the same time lose other features, such as: tear strength, hardness, effect reinforcement or application. It has been found that methods that should not be used as tire tread input for trucks or passenger cars have been changed, due to the excessive start that is found for this parameter.

Keywords: rubber industry, strength tests, natural and synthetic rubber

DATA HARMONIZATION AND CONSUMER'S SUPPORTED DECISION TOOLS FOR DIGITALIZATION IN FOOD INDUSTRY

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The food sector is driven by many entities, including producers and manufacturers, logistics providers, retailers, and on the end, the consumers. At each phase of the food value chain, a significant amount of data is generated that provides important information to the agents involved in processing and flow of food products from farm to fork.
Data harmonization is the process by which each of the variables from different sources and research are standardized to similar units resulting in comparable datasets. These data may be integrated for more powerful and accurate examination and prediction of outcomes for use in the intelligent and smart tools or software and systems in food industry for better decision-making process. Proper handling of food data has a crucial role in providing safe, quality, and affordable products to the increasing world population. In the food sector, one way of performing data harmonization is to represent food data according to reliable classification and description systems. Another approach towards harmonization is to match various food concepts to the existing and widely used ontologies. Food composition databases are major tools in food research, nutritional health care, food industry and many other areas that need information on nutritional composition of foods consumed. This study presents the literature review of the most important tools and frameworks for data harmonization in the food sector and the newest applications helping the consumers eat better and waste less food.

Keywords: food quality, data harmonization, food products databases, digitalization, consumer's applications

QUALITY EVALUATION OF FACIAL CLEANSING GELS WITH SURFACTIN-RICH DIGESTATE SOLVENT EXTRACT. PART I – FUNCTIONALITY

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The results of a study on the quality assessment of prototype facial cleansing gels produced from original recipes are presented. Raw materials of natural origin were used in gels preparation, and the concentration of solvent digestate extract was a variable in the formulation. The extract, according to the manufacturer's declaration, was rich in surfactin and used in concentrations of 20; 40 and 80% by weight. In this part of the work, studies for the obtained gels prototypes were performed to evaluate their functionality. Stability, viscosity, foaming properties, detergency properties and color were analyzed. The results were compared with those obtained for the reference sample, which was a gel prototype that did not contain the digestate extract.

All prototypes of face cleansing gels showed physicochemical stability. The introduction of digestate extract resulted in a decrease in viscosity values compared to the reference composition. However, the obtained values did not exclude the use the evaluated cosmetics as face cleansing gels. In the case of assessment of the foaming properties of the product prototypes, it was also shown that the value of foaming capacity and foam stability index decreased with an increase in the concentration of biotechnology-derived raw material in the sample. Colorimetric evaluation indicated that the extract introduced into the gels affected the change in their color, and at higher concentrations the change might be noticeable by the consumer. The obtained values of hydrophobic dirt removal efficiency after contact with the gels' solutions indicated that the introduction of the extract in the gels' prototypes improved their detergent properties compared to the reference sample.

The performed research showed that it is possible to obtain facial cleansing gels with a significant amount of the digestate extract providing satisfactory performance in terms of functionality.

Keywords: cosmetics, extract, funcionality, surfactin, quality.

THE POTENTIAL OF USING $KMnO_4$-LOADED BENTONITE IN ACTIVE PACKAGING EXTENDING FRUIT SHELF LIFE

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One of the most perishable foods in the supply chain are fresh fruits and vegetables, especially those transported from distant areas, for which the ripening process takes place during storage and distribution. The flagship examples are bananas packed in the form of harvest maturity in tropical and subtropical countries, which acquire consumption maturity during distribution. In addition to controlling the transport and storage conditions, it is important to ensure that the level of ethylene inside the banana package is reduced, which should significantly affect the rate of ripening and may extend the shelf life of the fruit.

Despite the wide availability of various ethylene scavengers, most of them are based on the use of potassium permanganate. In addition to the active agent (responsible for neutralizing the phytohormone), it is also important to select a carrier that will increase the active surface of the packaging insert. Usually, zeolites, silica gels, or other inorganic substances with an extensive surface structure are used here.

The study focused on the evaluation of the effectiveness of ethylene absorbers based on potassium permanganate deposited on bentonite or its natrified derivative, and a comparison with a popular commercial ethylene absorber in the storage of fresh bananas. Storage tests were carried out both in closed packages and those ensuring free exchange of gases with the environment, where in both cases packed fruits were stored with a normal access to sunlight or with its significant limitation. During the storage of bananas, changes in their appearance (signs of fruit ripening and spoilage) were assessed, as well as changes in their weight (for open packaging) and the composition of the atmosphere inside closed packaging. The introduction of ethylene scavengers slowed down the fruit ripening process and extended significantly its shelf life. Absorbers on a bentonite carrier (natrified and natural) turned out to be more effective in this action.

Keywords: active packaging, bentonite, ethylene scavenger, potassium permanganate

THE APPLICATION OF NEAR INFRARED (NIR) SPECTROSCOPY AND MULTIVARIATE ANALYSIS IN APPLE QUALITY MONITORING

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Industry 4.0 technologies show great potential for agro-food industry. Such technologies are applied e.g. in logistics, reduction of waste, data collection and monitoring, and quality control. Quality of food product can be defined through various characteristics, including nutritional value, physicochemical properties, microbiological safety, sensory attributes, and shelf-life stability. Non-destructive, non-targeted fingerprinting methods that enable the acquisition of information about several parameters simultaneously are more appropriate for measuring food quality than standard physicochemical methods. Recent advances have shown good potential of near infrared (NIR) spectroscopy in quality monitoring and modelling of different food processes of fruits including apples and their derivatives.

The aim of the study was: (1) to monitor changes in apples during storage, and (2) to predict basic quality parameters using NIR spectroscopy and multivariate analysis. Samples from four apple cultivars were studied, including Gala Royal (65 samples), Ligol (34 samples), Empire (35 samples), and Lobo (37 samples). The spectra of intact fruit were measured using diffuse reflectance techniques for fresh apples (at time T_0) and for apples after 14 days of storage (T_{14}). The soluble solids content and total acidity were determined using standard laboratory methods. Partial least squares discriminant analysis (PLS-DA) was applied in order to discriminate apples on the basis of storage time and the partial least squares (PLS) regression was used to predict quality parameters based on NIR spectra. Different methods of pre-processing were tested for model optimization. The results confirm that NIR combined with multivariate analysis represents a valid tool to evaluate quality parameters of apples in a non-destructive, rapid way and has the potential in supporting responsible production.

Keywords: apple, NIR spectroscopy, non-destructive evaluation, quality, storage

3D PRINTING AS A SOURCE OF PACKAGING INNOVATION

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Three-dimensional printing (3D printing) is an innovative process that creates physical objects using various materials such as metals, ceramic or polymers from a computer-aided design file. In 3D printing solid objects are formed from a geometrical representation by a successive addition on materials, point-by-point, line-by-line or layer-by-layer. This technique is very useful for rapid manufacturing, customized design and structural applications in the field of agriculture, medicine, automotive, locomotive, aviation industries, as well as in packaging sector. 3D printing can accelerate early-stage product development through rapid prototyping and decrease costs of product's commercialization, because additive manufacturing of single parts or a limited number of parts is cheaper than standard plastic processing techniques like injection molding, extrusion and thermoforming. Moreover, while personalized packaging is gaining of importance, 3D printing allows customers to design and make their own highly customized packages on request. Individual packaging designs can be manufactured specifically in accordance with customer wishes and various design of prototypes. Beyond rapid prototyping of a new packaging, this technique is useful in production of packaging machinery parts, such as printing robotic arms, and spare parts on demand. Furthermore, there's a number of sustainable packaging filaments available for use with 3D printing, such as celluloid fibres, bio-thermoplastic elastomers e.g., polylactic acid, and recycled plastics.

Keywords: 3D printing, innovation, packaging, quality

POSSIBILITIES OF APPLYING OWN MEASURING METHOD AND THE INNOVATIVE SENSOR TO STUDY ELECTRICAL PROPERTIES OF FRESH ENGINE OILS

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Necessity to search quick, easy and cheap methods of assessing the quality of engine oils, both fresh and spent, using alternative more commonly applied electrical methods results from the need of monitoring oil engine quality in the process of its production, sale and exploitation.

The aim of the research was to determine the suitability of selected electrical parameters with the use of our own measuring method as well as one innovative measuring sensor (rectangular) for the quality assessment of 19 selected fresh engine oils in the 5W-30 viscosity class.

Measurements of electrical parameters of engine oils were taken on the basis of our own developed electric equivalent model of engine oils (RCC) and our own measurement method, using an LCR meter (Agilent Technologies type) and devices ensuring the stability of measurement conditions. Then, on the basis of the results of the measurements of resistance and conductance as well as the constant parameters of the sensor, related to its geometric dimensions, the resistivity (ρ) and conductivity (σ) of the tested oils were calculated, which will be their electrical quality indicators. To determine the usefulness of the measurement sensor for testing the quality of engine oils, after taking the measurements and calculations the correlation analysis between the values of electrical parameters was conducted.

The results of measurements and calculations of fresh engine oils showed that both conductivity and resistivity values were very different depending on the oil type and frequency of measurement voltage. It was found that, as in the case of technical materials (metals, alloys, wood, glass, ceramics, etc.), resistivity (ρ) and conductivity (σ) are the basis for research on the development of quality electrical indicators and authenticity of fresh engine oils at certain frequencies of the measuring voltage.

Keywords: engine oils, quality electrical indicators, conductivity, resistivity, own measurement method

POSTER PRESENTATIONS

PRODUCT AND PROCESS MANAGEMENT

FOOD SAFETY MANAGEMENT OF FOOD IMPORTED INTO THE EUROPEAN UNION IN 2020 AND 2021 IN TERMS OF SELECTED MICROBIOLOGICAL HAZARDS

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In 2020, a total of 3792 notifications were registered in the RASFF, of which 995 were food infections and of these, as many as 735 were directly related to *Salmonella* contamination of products. In contrast, in 2021, a total of 4664 notifications were registered, of which 985 were microbiological hazards and as many as 715 notifications were linked to the presence of *Salmonella* bacteria.

The aim of this article was to analyse the notifications recorded in the RASFF in 2020 and 2021 regarding the most common *Salmonella* contamination risk. Two parallel criteria were used for evaluation. The first one concerned the frequency of occurrences in notifications, and the second one the effects on human health. Sankey diagrams were used to demonstrate the relationship between the country of origin of the product, the type of product and the actions taken. In addition, a Pareto-Lorenz diagram was used to isolate the products with the highest risk to consumers.

Poultry and poultry products were shown to be the most *Salmonella*-contaminated products imported into EU countries in 2020 and 2021. And they represent the biggest challenge in managing the safety of food consumed by EU citizens. However, it should be borne in mind that notifications registered in the RASFF system may not be an adequate source of data to assess the extent of the microbiological risk.

Keywords: food safety, quality, microbiological hazard, UE

FACTORS INFLUENCING THE QUALITY OF VOCATIONAL EDUCATION IN POST-SECONDARY SCHOOLS

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The objective of vocational education provided at post-secondary schools is to prepare students for work in specific professions. It is a series of didactic activities aimed at imparting a certain amount of theoretical and practical knowledge, and in particular specialised vocational skills, enabling graduates who have obtained a diploma confirming their qualifications to work in a given profession. Human capital, which is shaped by the education system and universal access to high quality education, is of key importance for progress and social and economic growth. This quality is conditioned by many factors, both economic and non-economic, and the task of the managers of the educational system units should be to strive to ensure high quality education.

The aim of this study was to identify the most important factors influencing the quality of vocational education in post-secondary schools in Poland.

The study used the technique of an individual, semi-structured interview conducted by telephone (CATI - Computer- Assisted Telephone Interview). Non-probability sampling was used and 5 interviews were conducted with managers of public and non-public post-secondary schools in Poland.

All managers of institutions considered that a very important factor influencing the quality of vocational education is the level of teachers' salaries. They also pointed to the teaching resources of the school, above all the equipment of the vocational laboratories with modern technological solutions used in the given professions. Another important factor is the teaching staff consisting of teachers practising in the given professions, as well as systematic in-service training and self-education of teachers. None of the establishments has implemented a Quality Management System according to the requirements of the ISO 9001:2015 standard, and 3 of the 5 schools systematically carry out surveys of student satisfaction and expectations. The managers of the public institutions stated that an important element of the internal quality management system in their schools is the pedagogical supervision plan, in which they carry out inspections, support teachers and conduct observations of selected classes.

Keywords: education quality, vocational education, post-secondary school

INTRODUCING THE PATHOGENS-IN-FOODS DATABASE - WEB RESOURCES FOR ASSESSING THE OCCURRENCE OF MICROBIOLOGICAL HAZARDS IN FOODS SURVEYED IN EUROPEAN COUNTRIES

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Studies addressing the occurrence of pathogens in foods surveyed in the farm-to-fork chain are vital in the development of pathogens' risk assessment models, risk management tools and meta-analysis by food safety authorities, but the existing data is mostly dispersed, non-standardized or not easily accessible.

The Pathogens-in-Foods (PIF) database aims to fill these gaps, by incorporating systematically organized occurrence data (prevalence and enumeration) of relevant pathogens in foods randomly surveyed in Europe. It is built upon a pre-established systematic literature search protocol, periodically applied to selected e-bibliographic databases for retrieval of peer-reviewed articles and reviews that include data on the occurrence of *Bacillus cereus*, *Campylobacter* spp., *Clostridium perfringens*, *Listeria monocytogenes*, *Salmonella* spp., Shiga toxin-producing *Escherichia coli*, *Staphylococcus aureus*, *Yersinia enterocolitica*, *Cryptosporidium* spp., *Giardia* spp., *Toxoplasma gondii*, Hepatitis A virus, Hepatitis E virus and Norovirus, in foods surveyed from primary production sites, processing facilities, retail and restauration establishments in Europe.

Once the studies are screened for relevance and their methodological quality is verified, the data is extracted into the database, following a built-in categorization protocol that includes general study characteristics, pathogen information and methods/techniques used for detection, food categorization, and prevalence and/or enumeration results.

PIF is easily accessed through an interactive interface (https://pif.esa.ipb.pt/) for easy data retrieval, producing dynamic graphs and summary statistics of the data available on the database. PIF is a free tool for food safety researchers and policymakers, that gathers reliable and quality assessed data to be used in microbiological risk assessment and help establish future food safety guidelines.

Keywords: Biological hazard, database, Europe, food safety, Pathogens-in-Foods, risk assessment, systematic review

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MICROBIOLOGICAL MYCOTOXINS DETOXIFICATION AS A SUSTAINABLE MYCOTOXINS MANAGEMENT STRATEGY

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Mycotoxins are secondary metabolites produced by filamentous fungi at different stages of the food chain, from the cultivation of crops in the field to the production of food. These metabolites demonstrate among others carcinogenic, mutagenic, teratogenic or oestrogenic effects on humans and animals. Mycotoxins with the highest impact on human health and economic status include aflatoxins, ochratoxins, deoxynivalenol, zearalenone, fumonisins, and patulin. It is worth to underline that according to Food and Agriculture Organization (FAO) estimation almost 25% of the world's cereals are contaminated with mycotoxins, which has led to significant economic losses. Therefore, in last decades some detoxification procedures including physical, chemical and biological methods have been developed as a part of management strategies. There has been also increasing interest in use of fermentative bacteria (lactic or propionic acid bacteria) as a compounds binding or detoxifying mycotoxins.

In the presented paper ability of *Propionibacterium freudenreichii* ssp. *shermanii* to bind *Fusarium* mycotoxins including zeralenone, deoxynivalenol and fumonisin B1 was investigated. Bacteria were cultivated in MRS medium for 48h, centrifuged and biomass was mixed with mycotoxins solutions to achieve concentration of toxins 10µg/ml. Bacteria were incubated with toxins under different conditions diversifying temperature, pH and time of the process. Concentration of mycotoxins was determined by HPLC analysis.

The results showed that tested strain of propionic acid bacteria significantly reduced mycotoxins concentration in liquid medium, but the efficiency of the process depended on the examined toxin and conditions. Reduction of mycotoxin concentration was quick process and was observed in a wide range of pH and temperature, however the effectiveness of removal process was strongly dependent on the initial concentration of toxin. The results show the usefulness of fermentative bacteria as mycotoxins removal agents.

Keywords: food and feed safety, quality, mycotoxins management, biological hazards, sustainable agriculture

VOLUNTARY ASSESSMENT OF FOOTWEAR IN THE LIGHT OF THE PN-EN ISO/IEC 17065 STANDARD, ON THE EXAMPLE OF THE "HEALTHY FOOT" MARK

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Nowadays, we observe an increase in consumer awareness. Among the wide range of offered goods and services, those that are distinguished by the best quality are selected.

Consumers in so-called "ecological society" choose proven and ecological products, characterized by greater durability and - what is important - the production of which took place with respect to the principles of sustainable development. In such a situation, the decision to choose and purchase a product will be facilitated by all kinds of quality marks, certificates or emblems.

As stated in the current regulations, in the case of casual footwear, there is no obligation to certify the product (certification is required only for safety footwear). There is only a voluntary assessment of footwear, which is carried out at the request of the footwear manufacturer by a research unit. According to the regulations, it does not have to be conducted at accredited laboratories.

The greater value - also in terms of marketing – is for the marks awarded by the Lukasiewicz Lodz Institute of Technology in the process of voluntary assessment of footwear ("Healthy foot" mark - footwear protect the proper development of feet for children under 15 years of age, "Footwear for diabetics", "Footwear for sensitive feet").

Different footwear quality marks inform customers about the good quality of the materials which were used to produce the footwear (low content of harmful substances and high hygienic parameters). Moreover, these signs are given to footwear that meets the construction and technological requirements, closely matched to the requirements of sensitive feet, feet of people with diabetes, and finally - children's feet, which are extremely susceptible to deformations and distortions.

The paper presents the results of the assessment of activities used in the procedure of granting the "Healthy Foot" mark, conducted in Lukasiewicz-ŁIT. The analysis was based on the EN ISO/IEC 17065:2012 standard.

Keywords: EN ISO/IEC 17065:2012, "Healthy Foot" mark, footwear quality

ARE LABELS EFFECTIVE IN ENSURING FOOD SAFETY? AN ANALYSIS BASED ON RASFF NOTIFICATIONS

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Food law, and particularly food information law, touches upon the life of every citizen inside of the European Union. It is an important element in assuring a high level of consumer protection by providing a basis for consumers to make informed choices in relation to the food they consume. EU Regulation 1169/2011 laid down rules on food labelling applicable to all foods, in particular, it drew up a list of mandatory information which should, in principle, be provided. Among them, the information concerning allergens seems to be of great importance. Other EU regulations introduced the possibility to place voluntary information on food packaging such as health claims, nutrition claims or other nutritional statements. Both mandatory and voluntary information or their lack may influence perceived safety and thus shape buying behavior.

The objective of this work was to analyze the European notifications in Rapid Alert System for Food and Feed (RASFF) portal related to faulty labelling (both allergens and other labelling deficiencies) issued in the period from 01/01/2020 to 31/07/2023. The following data were extracted and analyzed: date of notification, notifying country, country of origin, product category, subject, notification basis, notification type, risk decision. 647 notifications in the period from 01/01/2020 to 31/07/2023

Despite the efforts made by the European Union to increase controls and consumers' information through labeling, the results of the present study show that the risk due to the faulty labelling continues to be a problem. A total of 647 notifications were published in food products in the analyzed period, among which 79.3 % were related to allergens, and 20.7 % concerned other labelling deficiencies.

Keywords: food label, food safety, RASFF, allergens

POSTER PRESENTATIONS

SUSTAINABLE PRODUCTION AND CONSUMPTION

TOWARDS A SUSTAINABLE FUTURE: EXPLORING ECOLOGICAL AND SOCIAL INNOVATIONS IN THE TEXTILE INDUSTRY

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The textile and fashion industry is one of the largest and oldest industries in the world. In the European Union, the sector's turnover in 2020 was approximately 127 million euros. The textile industry is undergoing a significant transformation as sustainability becomes a critical focus. With growing concerns about the impact of the industry on the planet and society, there is a pressing need for change. The development of the textile industry towards more sustainable and circular operation models supports the Sustainable Development Goals 12 of the United Nations: Responsible consumption and production, and 9: Industry, innovation, and infrastructure. In the search for solutions to the environmental impacts of textile production, the bioeconomy plays a crucial role. It provides new, sustainably produced biobased and recyclable raw materials, recycling of materials and closed-loop operations, as well as technologies, innovations, and skills needed for all this. The article explores the ecological and social innovations that are driving this change and propelling the industry towards a more sustainable future. By examining the adoption of sustainable practises, such as eco-friendly materials, energy-efficient manufacturing, and waste reduction measures, the article highlights the industry´s commitment to mitigating its ecological footprint. Moreover, it explores the implementation of social initiatives like fair trade, worker welfare programmes, and supply chain transparency, which aim to address labour rights and improve the lives of workers. The article examines the impact of these innovations on both the environment and stakeholders within the industry and also highlights the role of consumer awareness and changing preferences in driving sustainability efforts. Through this exploration, the article provides valuable information on the ongoing journey toward sustainability in the textile industry and the opportunities and challenges that lie ahead.

Keywords: sustainability, textile industry, innovations, stakeholder engagement

QUALITY OF LIFE OF ORGANIC AND CONVENTIONAL FRUIT GROWERS - A PILOT STUDY IN THE CO-FRESH PROJECT

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Quality of life is a multidisciplinary concept of growing interest. It is a reflection of health, psychological and social status, as well as independence, environmental factors and a person's personal beliefs. Quality of life is reflected in an individual's sense of happiness and efficiency. The aim of our study was to compare the subjective quality of life of organic and conventional fruit growers.

Fifty-six fruit growers practicing in the Mazowieckie and Łódzkie Voivodships took part in the study - 32 practicing organic farming and 24 practicing conventional farming. Participants had their body weight and height measured. The WHOQOL-BREF questionnaire was used to estimate quality of life.

The mean age in the whole study group was 45±9.2 years. Mean weight and height were 83.7±16.2 kg and 172.2±9.2 cm, respectively, and the mean BMI was 28.11±4.31 kg/m^2. On the 100-point quality of life scale, study participants scored 74.34±14.1 in the physical domain, 72.36±12.9 in the environmental domain, 81 (44-100) in the psychological domain and 78 (50-100) in the social domain. Although organic orchardists obtained higher scores, both overall and in individual domains, these differences were not statistically significant ($p>0.05$, t-test and Wilcoxon test). No relationships was found between quality of life and gender, financial situation and educational level ($p>0.05$, ANOVA and Kruskall-Wallis test). No correlation was found between quality of life and body mass, BMI, age and physical activity ($p>0.05$, Spearman's test and Pearson's test). A correlation was found between height and scores obtained in the physical domain in men ($p=0.011$, Pearson test), but no correlation was found in women ($p>0.05$, Pearson test).

In conclusion, the quality of life among orchardists was at a good level both in terms of self-assessment and the scores obtained with the questionnaire. Taller men showed better results in the physical domain.

Keywords: organic food; quality of life; conventional orchardists, organic orchardists; fruit growers; CO-FRESH project

CAN FLAVOURED DAIRY PRODUCTS BE PART OF A HEALTHY SUSTAINABLE DIET?

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Dairy products play a role in the Sustainable Development Goals being a source of high-quality protein (Goal 2 – Zero hunger) and a profitable branch of economy brining more than 10 billion EUR to the overall European Union balance sheet (Goal 8 – Decent work and economics growth). The content of protein, fat, sugars, some minerals, and vitamin B_2 in dairy products is essential in determining their contribution to the recommended daily intake of nutrients. The composition of dairy products can vary depending on the technological process, the manufacturer or the type and amount of ingredients used. Therefore, the aim of this study was to determine and compare the content of selected nutrients in flavoured yogurts and homogenized cheese. Flavoured products are less balanced than their plain counterparts, especially due to the presence of artificial ingredients and added sugars. However, they are an attractive alternative to unhealthy snacks due to their relatively high content of calcium, phosphorus and vitamin B_2, low content of saturated fatty acids, low to moderate energy value and their accessibility to many populations worldwide. Furthermore, dairy products have intermediate environmental impact compared to the high impact of meat and low impact of plant-based food. At the same time, consumption of an extra dairy food serving per day is not typically associated with adverse health effects. As defined by the World Health Organisation and the Food and Agriculture Organisation of the United Nations, healthy sustainable diets are nutrient-rich, low-cost (affordable), culturally acceptable and environmentally friendly. Therefore, moderate consumption of flavoured yogurts and homogenized cheese can be considered as part of a healthy sustainable diet.

Keywords: dairy, food safety, healthy sustainable diet, homogenize cheese, quality, yogurt

FORMATION OF HEALTH-PROMOTING QUALITY CHARACTERISTICS OF RYE BREAD USING POMACE FROM SEA BUCKTHORN FRUIT

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The aim of the study was to determine the effect of the addition of sea buckthorn (*Hippophae rhamnoides*) fruit pomace, which is a valuable source of biologically active compounds, on the formation of selected quality attributes of white rye bread.

The research material consisted of four baking variants of bread with rye flour type 720, differing in the level of addition of sea buckthorn fruit pomace in the recipe (5%, 10%, 15% and 20%) and the control variant (with 100% rye flour). The bread was produced in laboratory conditions on rye sourdough (three-phase method), in two baking batches. The assessment of the influence of the addition of sea buckthorn fruit pomace on the quality characteristics of experimental baked goods, related to the concentration of selected biologically active substances, was carried out on the basis of the content of: total lipids and the composition of fatty acids, total phenolic compounds, total carotenoids and lutein, zeaxanthin, cryptoxanthin, α-carotene, β-carotene, total protein and its fractions.

The research showed that the addition of sea buckthorn fruit pomace had a significant effect on changes in the total protein content and its fractions in the tested rye bread. Moreover, in the baking variants with the use of these pomace, the content of total lipids, total phenolic compounds, total carotenoids and lutein significantly increased. The composition of fatty acids was also favorably modified, with the greatest increase in the content of palmitoleic acid.

To sum up, rye bread enriched with 15% and 20% of sea buckthorn fruit pomace was characterized by the best quality and pro-health properties, resulting from a higher (beneficial) concentration of the tested biologically active substances. From the point of view of product quality and environmental management, the reuse of waste - fruit pomace in food production, can also help in the implementation of sustainable consumption and "zero waste" strategies.

Keywords: rye bread, sea buckthorn pomace, quality, biologically active substances, sustainable consumption

ANTIMICROBIAL AND ANTIOXIDANT ACTIVITY OF HOMEMADE MIXTURES

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In recent years, there has been an increasing trend among consumers to reach for natural ways to deal with infections and interest in traditional medicine. There are many different recipes that, according to the authors, may inhibit the growth of bacteria, fungi or viruses. However, there are no studies that unequivocally confirm these declarations. In the literature, most often studies on individual components could be found, not specific mixtures. Most of them use herbs or fruits with known antibacterial properties such as garlic, onion, turmeric or lemon, however, various compositions are proposed. Meanwhile, research indicates that the composition of the mixture may be crucial for their antimicrobial impact.

The aim of the presented study was to evaluate the antimicrobial properties of 15 self-prepared drinks based on recipes found in various portals or social media and indicated as mixtures with antibacterial, antifungal and even antiviral properties. In the composition of mixtures water or milk as base were used with citrus fruits and different spices such as: ginger, turmeric, cardamom, cayenne pepper. The antimicrobial activity of the prepared mixtures was determined by the well diffusion method towards differentiated microorganisms including Gram-positive and Gram-negative bacteria: *Micrococcus luteus, Staphylococcus aureus, Bacillus subtilis, Enterococcus faecalis, Escherichia coli, Pseudomonas aeruginosa, Salmonella enteritidis, Proteus vulgaris* as well as towards fungi including *Candida albicans* and *Rhodotorula mucilaginosa*.

The obtained results showed that majority but not all of tested mixtures exhibited antimicrobial activity against tested microorganisms. The effect of mixtures depended strongly on the composition as well as the sensitivity of the microorganisms used in the research.

Keywords: microbiological hazard, antimicrobial activity, consumers trends

INFLUENCE OF THE CULTIVATION METHODS ON THE CHEMICAL COMPOSITION OF GARLIC

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Before reaching the recipient, vegetables, including garlic, are exposed to many hazards related to the risk of losing their nutritional value. The safety and quality of plant products should be monitored, starting from the cultivation itself. Knowledge of the chemical composition of vegetables and its constant analysis is extremely important due to the constant introduction of changes optimizing cultivation, primarily in terms of fertilization and applied protection measures. Garlic has a rich chemical composition. It contains numerous micro- and macroelements (e.g. potassium, phosphorus, magnesium, iron, calcium, zinc, copper, nickel, cobalt, chromium, selenium, boron and germanium) and vitamins (C, A, PE, vitamins from group B). Many factors influence the chemical composition of garlic. One of them is the genotype. Choosing the right variety of garlic has a big impact on obtaining a good quality crop. Growing conditions can significantly affect the chemical composition of garlic. The crop can be used to manipulate the content of bioactive compounds and, consequently, to obtain the right quality of the final product. Garlic can be grown by several methods, differing in size and place of cultivation as well as the method of fertilization. Garlic cultivation is demanding in terms of the demand for nutrients, therefore an appropriate fertilization regime must be maintained. The time of harvesting and the method of storage also affect the quality and chemical composition of the crop.

With the above issues in mind, in the discussed study, research was carried out to verify the composition of garlic from: home cultivation, allotment with ecological cultivation, allotment with mineral fertilization and from industrial cultivation. The content of vitamins, light metals, total phosphorus and microelements was determined. An interview with the farm owner was also prepared, supplementing the information with reliable data. Based on the results of the research, it was found that the organic cultivation of garlic gives a crop with the richest chemical composition in comparison with other crops, in particular with industrial cultivation. Garlic samples from organic farming were distinguished by the highest content of vitamin C, B1, potassium and phosphorus.

Keywords: bioactive compounds, chemical composition, cultivation methods, ecological cultivation, industrial cultivation, garlic, micro- and macroelements, mineral fertilization, quality, safe food

PERCEPTION OF FOOD WASTE PROBLEMS IN THE CONTEXT OF SUSTAINABLE CONSUMPTION

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Preventing food waste is key to achieving one of the sustainable development goals, i.e. halving the amount of food waste per EU inhabitant at retail and consumer levels by 2030. The scale of household waste is directly influenced by individual consumers.
The aim of the study was to analyse the consumers' perception of the problem of food waste. The research covered the dimension of food waste, taking into account the problem of its measurement and reporting at the level of individual households. Existing data, i.e. formal and commercial reports and statistics, were researched. It was assumed to show the current state of consumer interest in the issues of food waste and responsible consumption. The research was interpretive.
The paper presents that reducing the scale of food waste is conditioned by consumer attitudes. It was found that there is a trend of increasing consumer awareness regarding the impact of their lives on the environment and their role in reducing waste. Consumer interest in the problem of food waste has also been demonstrated. It was pointed out that there is still a need to popularize the issue of minimizing food waste and to promote this problem in Poland in order to pursue sustainable consumption.

Keywords: food waste, sustainable consumption, consumers, waste

GENERAL SCHEDULE OF THE CONFERENCE

SEPTEMBER 13th, WEDNESDAY

9.00 – 9.20	**OPENING CEREMONY** **Maciej Żukowski**, Rector of Poznań University of Economics and Business, Poland **Ewa Sikorska**, Director of Institute of Quality Science, Poznań University of Economics and Business, Poland **Invited guest**, State University of Trade and Economics, Kyiv, Ukraine
9.20 – 10.00	**OPENING LECTURE** **Eva Waginger**, WU Vienna University of Economics and Business, Austria *The twilight of commodity science. Don't contemporary economists need to know about commodities?* Chair: **Zenon Foltynowicz**, Poznań University of Economics and Business, Poland
SESSION 1. PRODUCTS QUALITY AND SUSTAINABILITY – CONSUMERS PERSPECTIVE Chair: **Zenon Foltynowicz**, Poznań University of Economics and Business, Poland	
10:00 – 10:15	**Barbara Borusiak**, Poznań University of Economics and Business, Poland *How to build intention to reduce consumption? The mediating role of self-efficacy*
10:15 – 10:30	**Urszula Garczarek-Bąk**, Poznań University of Economics and Business, Poland *Inclusive consumer – exploring the perspective of highly sensitive students*
10:30 – 10:45	**Hubert Dobrowolski**, Warsaw University of Life Sciences, Poland *Young-adult consumers' perceptions of a food product in relation to the presentation of food additives – a pilot study*
10:45 – 11:00	**Martyna Fira**, SGH Warsaw School of Economics, Poland *What constitutes a product's greenness? The perspective of academia, business and regulatory institutions*
11:00 – 12:00	**COFFEE BREAK - POSTER SESSION**
12.00 – 12.40	**KEYNOTE LECTURE** **Paulo Sampaio**, University of Minho, Portugal *Quality needs to be reinvented!* Chair: **Eva Waginger**, WU Vienna University of Economics and Business, Austria
SESSION 2. EMERGING TECHNOLOGIES FOR QUALITY AND QUALITY MANAGEMENT Chair: **Ryszard Cierpiszewski**, Poznań University of Economics and Business, Poland	
12.40 – 12.55	**Mariusz Tichoniuk**, Poznań University of Economics and Business, Poland *Digital Product Passport as an important mechanism supporting the circular economy*
12.55 – 13.10	**Andrzej Marcinkowski & Paweł Haręża**, Lodz University of Technology, Poland *Life Cycle Assessment of subgrade construction using various technologies*

13.10 – 13.25	**Paweł Niszczota & Iga Rybicka**, Poznań University of Economics and Business, Poland *Assessing diets formulated by chatgpt: safety, accuracy, and tradeoffs for food allergies*
13.25 – 13.40	**Nathália Fernandes**, Instituto Politécnico de Bragança, Portugal *Genomics and technological features of lactic acid bacteria isolated from Alheira, a traditional fermented sausage produced in Portugal*
13.40 – 15.00	**LUNCH**
15.00 – 15.40	**KEYNOTE LECTURE** **Małgorzata Wiśniewska**, University of Gdańsk, Poland *Food safety culture and just culture in food safety management* Chair: **Paulo Sampaio**, University of Minho, Portugal
SESSION 3. FOOD QUALITY AND SAFETY MANAGEMENT Chair: **Małgorzata Krzywonos**, Wrocław University of Economics and Business**,** Poland	
15.40 – 15.55	**Janusz Olejnik**, Food Fakty, Poland *Different faces of food adulteration. From innocent optimizations of product composition to treatments that cause serious health risks.*
15.55 – 16.10	**Sebastian Stępień**, Poznań University of Economics and Business, Poland *Development of short food supply chains in a post-pandemic environment - a farmer's perspective*
16.10 – 16.25	**Marcin Pigłowski**, Gdynia Maritime University, Poland *Notifications on honey in the Rapid Alert System For Food and Feed (RASFF)*
16.25 – 16.40	**Mária Májek**, Slovak University of Agriculture in Nitra, Slovakia *Assessment of sustainability and food security in selected European countries and regions*
16.40 – 16.55	**Jakub Berčík**, Slovak University of Agriculture in Nitra, Slovakia *The use of emerging methods in determining the effectiveness of nutritonal labelling*
16.55 – 17.10	**Taras Karavayev & Nataliia Prytulska**, State University of Trade and Economics, Kyiv, Ukraine *Development of bachelor's and master's training in entrepreneurship and quality management at State University of Trade and Economics*
19.30 – 24.00	**OFFICIAL CONFERENCE DINNER**

SEPTEMBER 14th, THURSDAY

9.15 – 9.20	**OPENING**, Poznań University of Economics and Business, Poland
9.20 – 10.00	**KEYNOTE LECTURE** **Harshadrai Rawel**, University of Potsdam, Germany *Characterization and valorization of agricultural and food industrial wastes – the case of coffee production* Chair: **Diego Luis García González**, Instituto de la Grasa (CSIC), Spain
SESSION 4. SUSTAINABLE PRODUCT DESIGN Chair: **Barbara Borusiak,** Poznań University of Economics and Business, Poland	
10.00 – 10.15	**Tess Waldbach Braga**, University of Potsdam, Germany *Fucoxanthin rich microalgae for the age appropriate care of small animals*
10:15 – 10:30	**Ana Faria**, Instituto Politécnico de Bragança, Portugal *Comparison of physicochemical and microbiological properties of Alheira sausages from two artisanal producers in the northeast of Portugal*
10:30 – 10:45	**Karolina Wiszumirska**, Poznań University of Economics and Business, Poland *Influence of chitosan-based coating on improvement of barrier properties of biodegradable films*
10.45 – 11.00	**Karolina Chmielewska-Pruska**, Lodz University of Technology, Poland *The comparison of the effect of various environments on the degradation of porous pots made form bio-poly(butylene succinate)*
11.00 – 11.15	**Michał Puchalski**, Lodz University of Technology, Poland *Ecological trends in design on the example of works of industrial design students*
11.15 – 12.15	**COFFEE BREAK - POSTER SESSION**
12.15 – 12.55	**KEYNOTE LECTURE** **Rhomdane Karoui**, Artois University, France *Determination of the quality of food products during technological process and storage by the application of targeted and untargeted techniques: advantages and drawbacks* Chair: **Harshadrai Rawel**, University of Potsdam, Germany
SESSION 5. ADVANCED METHODS FOR QUALITY CONTROL Chair: **Aleksandra Wilczyńska,** Gdynia Maritime University, Poland	
12.55 – 13.10	**Diego Louis García-González**, Instituto de la Grasa (CSIC), Spain *Analytical strategies for identifying flavour compounds associated with virgin olive oil characterized with green fruity positive attributes and low levels of sensory defects*
13.10 – 13.25	**Antonio Francesco Caputi**, University of Bari "Aldo Moro", Italy *Spectrofluorimetric analysis combined with chemometrics for varietal and quality assessment of red wines from Southern Italy*
13.25 – 13.40	**Naisargi Varma**, Adam Mickiewicz University, Poland *Vitamin B2 derivatives as a singlet oxygen photosensitizer*

13.40 – 13.55	**Anna Dankowska**, Poznań University of Economics and Business, Poland *The application of near infrared spectroscopy in quality assessment of dried herb*
13.55 – 14.10	**Mariola Zimoń**, COMEF Sp. z o.o. Sp. k., Poland *Compact and modular spectrofluorimeters of Horiba*
14.10 – 15.30	**LUNCH**
15.30 – 17.00	**SESSION ORGANIZED BY COMMITTEE ON COMMODITY SCIENCE - QUALITY SCIENCE AT THE POLISH ACADEMY OF SCIENCES – POZNAŃ BRANCH** (*in Polish*) **Marian Gorynia**, Poznań University of Economics and Business *The evolving identity of economic sciences - classification problems* Chair: **Ewa Sikorska**, Poznań University of Economics and Business, Poland
18.00 – 20.00	**POZNAŃ SIGHTSEEING**

SEPTEMBER 15th, FRIDAY

9.00 – 9.05	**OPENING**, Poznań University of Economics and Business, Poland
9.05 – 9.45	**KEYNOTE LECTURE** **Antonella Pasqualone**, University of Bari, Italy *From food waste to functional foods: application to the cereal food chain* *Chair*: **Rhomdane Karoui**, Artois University, France
	SESSION 6. SUSTAINABLE FOOD Chair: **Stanisław Popek,** Cracow University of Economics, Poland
9.45 – 10.00	**Małgorzata Krzywonos**, Wrocław University of Economics and Business, Poland *Upcycled food as sustainable solution for food waste*
10.00 – 10.15	**Martina Hudecová**, Slovak University of Agriculture, Slovakia *Understanding the consumer behaviour of generation x and y regarding functional foods*
10.15 – 10.30	**Natalia Kłopotek**, Gdynia Maritime University, Poland *Organically farmed yerba mate perceived by a selected group of consumers*
10.30 – 10.45	**Peter Šedík**, Slovak University of Agriculture, Slovakia *Taste the sweet revolution: an urban study on consumer behavior towards flavoured honey among the igeneration*
10.45 – 11.45	**COFFEE BREAK - POSTER SESSION**
11.45 – 12.25	**KEYNOTE LECTURE** **Bazyli Czyżewski & Łukasz Kryszak**, Poznań University of Economics and Business, Poland *Agricultural greenhouse gases and food security inefficiencies in countries with different land productivities: Policy orientation and global targets* Chair: **Giulio Cappelletti**, University of Foggia, Italy
	SESSION 7. SUSTAINABILITY AND CIRCULAR ECONOMY Chair: **Renata Salerno-Kochan**, Cracow University of Economics, Poland
12.25 – 12.40	**Giulio Cappelletti**, University of Foggia, Italy *Assessing sustainability of recycled stretch film*
12.40 – 12.55	**Tomasz Nitkiewicz**, Częstochowa University of Technology, Poland *Managing circularity of packaging for food products – carbon footprint assessment of innovative coated paper packaging*
12.55 – 13.10	**Małgorzata Kopeć-Kaniowska**, Jagiellonian University, Poland *Strategic CSR management of MedTech corporations, pre-test*
13.10 – 13.25	**Zenon Foltynowicz**, Poznań University of Economics and Business, Poland *Circular economy as a step towards ecological civilization*

13.25 – 13.40	**CLOSING CEREMONY** **Ewa Sikorska**, Poznań University of Economics and Business, Poland
13.40 – 14.40	**LUNCH**

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