Book of abstracts

of International Scientific Conference on Food Sensory Science

‘SEASONED in 4 Seasons’

SEASONED™

Wrocław, 2025

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Magdalena Kozińska-Skrzypiec
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ul. Sopocka 23, 50–344 Wrocław, tel. 71 328 12 77
e-mail: wydawnictwo@upwr.edu.pl

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International Scientific Conference on Food Sensory Science 'SEASONED in 4 Seasons'

Wrocław, 25–26 June 2025

PROGRAMME

DAY 1 (25.06.2025)

Place: Wrocław University of Environmental and Life Sciences (UPWr)
Center for Applied Biology and Innovative Food Production Technologies
39 Chełmońskiego Str., 51-630 Wrocław

8^{00}–9^{00}	**Registration and welcome to UPWr**
9^{00}–9^{15}	**Opening of the conference** *Agnieszka Kita (UPWr)* *Sara Spinelli (E3S)*
9^{15}–11^{00}	**Session 1 – Sensory analysis in academia and business**
9^{15}–9^{45}	**Plenary lecture** **When is sensory testing essential and when is it not!** *Edgar Chambers IV (KSU)*
9^{45}–10^{05}	**Seasoned lecture** **Role of sensory evaluation panels in the accreditation of food quality schemes.** *Ángel A. Carbonell-Barrachina (UMH)*
	Short communications
10^{05}–10^{20}	**Inclusive design as a tool for products improvement.** *David López-Lluch (UMH)*
10^{20}–10^{30}	**Cross-national consumer insights on herbal-infused reconstituted fruit beverages: a comparative study of Poland and Switzerland.** *Nesa Dibagar (UPWr)*
10^{30}–10^{40}	**The Influence of lavender and lemon essential oils constituents on environmentally sustainable consumer choices.** *Julia Wolska (UPWr)*
10^{40}–11^{00}	***Discussion***
11^{00}–11^{45}	***Coffee break and poster session***
11^{45}–13^{15}	**Session 2 – Sensory analysis in new product development**
11^{45}–12^{15}	**Plenary lecture** **Sensory Secrets: Texture's influence on food intake, consumer behaviour, and implications for product reformulation.** *Paula Varela-Tomasco (Nofima)*
12^{15}–12^{35}	**Seasoned lecture** **A multi-dimensional approach to new food development: Examining the interaction of sensory properties, consumption context, and cultural significance.** *Laura Vázquez-Araújo (BCC)*
	Short communications
12^{35}–12^{45}	**Sensory expectations in the co-creation process as tools for developing products for people with specific dietary needs.** *Artur Głuchowski (SGGW)*
12^{45}–12^{55}	**Comparison of sensory quality perceptions of gluten-free cookies evaluated by celiac and non-celiac people.** *Daria Musiienko (CZU)*

12^{55}–13^{05}	**Shaping the sensory attributes of sous-vide chicken breast by the addition of novel condiments mixes containing blackcurrant pomace.** *Małgorzata Korzeniowska (UPWr)*
13^{05}–13^{15}	***Discussion***
13^{15}–14^{15}	***Lunch break***
14^{15}–15^{45}	**Session 3 – Perception and motivation in consumer science**
14^{15}–14^{45}	**Plenary lecture** **Psychographics in the development of healthy and sustainable food products** *Speaker: Erminio Monteleone (UNIFI)*
14^{45}–15^{05}	**Seasoned lecture** **Diversity in the determinants of consumer acceptance of plant-based foods** *Speaker: Davide Giacalone (SDU)*
	Short communications
15^{05}–15^{15}	**Sensory aspects in the design of low-GI catering meals using the co-creation process** *Speaker: Katarzyna Świąder (SGGW)*
15^{15}–15^{25}	**Aroma – not just the hedonic value of food** *Speaker: Jacek Łyczko (UPWr)*
15^{25}–15^{35}	**The potential of mold-derived umami - natural flavour enhancers in Europe** *Speaker: Maciej Król (European Miso Institute)*
15^{35}–15^{45}	***Discussion***
15^{45}–16^{15}	***Coffee break***
16^{15}–17^{00}	**Expert panel - why do we need sensory analysis?** *Edgar Chambers, Paula Varela-Tomasco, Erminio Monteleone, Elena Kotsaki*
17^{00}–17^{30}	**The Section of Food Sensory Analysis of PTTŻ members' assembly**
19^{30}–24^{00}	**Conference banquet**

DAY 2 (26.06.2025)

Place: **Mondelez RD&Q**
1A Czekoladowa Str., 55-040 Bielany Wrocławskie

8^{30}	**Departure from UPWr to RD&Q ***
9^{00}	**Guests' arrival at RD&Q**
9^{00}–9^{30}	**Registration & settling in**
9^{30}–10^{30}	**Mondelez introduction, Consumer Science & real case presentation**
10^{30}–12^{00}	**Consumer Science lab tour and practical applications**
12^{00}–13^{00}	***Lunch break***
13^{00}–13^{30}	**Coffee chat with MLDZ Senior Leaders**
13^{30}–14^{30}	**Pilot plant tours and product presentation**
15^{00}	**Departure from RD&Q to UPWr**

* Meeting point in front of the conference venue building: Center for Applied Biology and Innovative Food Production Technologies, 39 Chełmońskiego Str., 51-630 Wrocław. Transportation provided by the conference organizers.

PROJECT SUMMARY

FOOD SENSORY SCIENCE RESEARCH.

The project aims is to improve the knowledge, skills, and competencies of the research and admin staff of UPWr in the field of the sensory evaluation of food and consumer behaviour with special attention to newly designed innovative processed food products with healthrelated properties. The project also aims to establish an international network among leading universities and centres in food sensory analysis to prepare competitive research applications/proposals within the EU and global challenges (UN SDGs).

The project aims to establish an international network of leading universities, centres in food sensory analysis and innovation consultants (SDU, UMH, BCC, REDINN) to step up in science and research, improving managerial and administrative capacities, networking skills and strategies to engage society and citizens as well as public authorities and private businesses, and regional and European institutions. SEASONED will enable FBFS and its partners, leading research institutions from Spain, Denmark, and Italy, to co-develop a capacity building programme to share and integrate expertise and skills to access new research avenues and develop new approaches to prepare competitive research applications within the EU and global challenges (Green Deal, UN SDGs). Implementing Gender Balance Monitoring, Open Science, Citizen's Engagement, FAIR data research principles, and monitoring of Key Performance Indicators project will create short–to long-term societal, scientific, and economic impacts. Ultimately, UPWr's ambition is to develop and reach the top of the sensory evaluation centres' competencies and become the leading centre of excellence in Central and Eastern Europe (CEE). As a result, at the end of the project and far beyond the project duration, UPWr wants to establish a Consumer Behaviour Centre (CBC). SEASONED CBC will be a unique platform dedicated to scientists (ESRs including the MSc and PhD students, ERs, other scientists from national and international units), business partners and consumers from this part of Europe.

SEASONED™

PREFACE

This volume presents the Book of Abstracts for the first international conference in sensory science organized under the title 'Seasoned in 4 Seasons'. This event marks a milestone for the SEASONED project and for the broader sensory science community.

Hosted by the Wrocław University of Environmental and Life Sciences, and co-organized with the Polish Food Technologists' Society (PTTŻ) – Section of Food Sensory Analysis and RD&Q Mondelez International this conference brings together experts, researchers, and industry partners to explore how sensory perception shapes the way we experience food – across seasons, cultures, and contexts.

The SEASONED project is committed to advancing our understanding of sensory-driven food behaviors and translating that knowledge into innovation, health strategies, and better consumer experiences. This event is a platform for presenting fresh insights, sharing methodologies, and building collaborations that stretch beyond academic borders.

The abstracts in this collection reflect the scope and vitality of current sensory science research. From perception and preference to product design and policy implications, they showcase the essential role of sensory insights in shaping the future of food

Prof. Agnieszka Kita

Project Coordinator, SEASONED

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POSTER PRESENTATIONS

KEYNOTE SPEECHES

International Scientific Conference on Food Sensory Science
'SEASONED in 4 Seasons'
Wrocław, 25–26 June 2025

ROLE OF SENSORY EVALUATION PANELS IN THE ACCREDITATION OF FOOD QUALITY SCHEMES

Ángel A. Carbonell-Barrachina, Hanán Issa-Issa, Luis Noguera-Artiaga

Centro de Investigación e Innovación Agroalimentaria y Agroambiental, Universidad Miguel Hernández de Elche, Orihuela, Alicante, Spain

e-mail: angel.carbonell@umh.es, hissa@umh.es, lnoguera@umh.es

Keywords: descriptive sensory analysis, comparative sensory tests, discrimination tests, product verification, specificity, wine

Accreditation is an essential process to deliver confidence in everyday life, including food products. Accreditation demonstrates the competence, impartiality and capability of the certifying bodies certifying, including the regulating councils of Protected Designations of Origin (PDO) and Protected Geographical Indication (PGI). These regulatory bodies are certified by the ISO 17065 (requirements for bodies that certify products, processes and services) but the sensory panels are evaluated using requirements from the ISO 17025 (requirements for the competence of testing and calibration laboratories). In general, the key word in the accreditation process is specificity. Producers must invest in producing sensory attributes which are specific of protected products, otherwise these products will end up being generic products. UE Regulation defines the quality schemes for agricultural products and foodstuffs, including their sensory description. Thus, there must be an official sensory control to verify that the product fulfills the defined sensory characteristics. The aim of the sensory evaluation is to check product conformity with the geographical indication specifications by using adequate methods of analysis. The conformity must include: (i) identification of the specific characteristics of the product, and (ii) the absence of defects. The main aspects to be controlled during the audit of the system of a regulating body include: personnel, working environment, methodology of evaluation, reference materials, sampling, processing and preparation, and quality control. However, there are different strategies to obtain the certification. Two of these strategies will be presented as models that can be followed internationally. The first one will be a traditional approach describing "completely" the product using descriptive sensory analysis (including product lexicon, reference materials, etc.). This approach will be explain using information for the PDO Alicante (https://vinosalicantedop.org/certificacion/). The obtained sensory profile is compared with the standard profiles of the vines under the PDO Alicante, and the final result is whether the wine under study fulfills the specific requirements of this PDO, but also is the session is valid and the panel performance is correct. The second one will be a more recent approach in which the product is globally compared to the product specifications, based on the experience of the

panel members. A general comparative analysis is followed analyzing the following phases: (i) visual, (ii) olfactory (intensity and quality), (iii) tasting (intensity and quality), and (iv) harmony. The final result is whether the product under study can be verified as fulfilling the established requirements of a specific PDO. This strategy is followed by the Galician wine PDOs.

Funding: *The authors thank Generalitat Valenciana (Conselleria de Educación, Cultura, Universidades y Empleo) for funding the research group "Food Quality and Safety, CSA" through the projects REF. AICO/2023/198*

WHEN IS SENSORY TESTING ESSENTIAL AND WHEN IS IT NOT!

Edgar Chambers IV, Delores Chambers

Center for Sensory Analysis and Consumer Behavior, Kansas State University Manhattan, KS, USA

e-mail: eciv@ksu.edu, delores@ksu.edu

Keywords: sensory, strategy, product development

The SEASONED project has created a network for sensory collaboration and product development efforts. One key aspect of the product development process is sensory (including consumer) testing to help the marketplace success of products. Such work is critical to food products at various stages in the process. However, sensory testing is expensive and time-consuming, and must be conducted properly, or incorrect information may be obtained. This talk discusses how sensory testing can be helpful across the stages of the food product development process, but also identifies situations when sensory testing does not provide useful information and should not be conducted. Sensory testing should be used in all stages of the product development process, from capturing or inventing ideas, to scoping product options and markets, developing product options from initial development through final optimization, scaling and commercialization of the product, and maintenance or improvement of the product throughout its lifespan. Various types of sensory testing are needed, including qualitative and quantitative testing with screened, trained, or naïve respondents. Identification of consumer needs using qualitative methods with both experts and naïve consumers, determining key characteristics of products using trained panelists and naïve consumers, scoping ingredients and marketplace products using quantitative methods, testing developmental and finished foods with various techniques, and making sure consumers receive consistent products using quantitative methods are all critical parts of the product development process. However, sensory studies should never be so routine and overused that the data are not used appropriately. Other potential issues can impact the usefulness of sensory data, including the "golden tongues" of management; needs external to the product development, marketing, or production process; "quick and dirty" testing that violates fundamental protocols, or testing that is not suitable for the needed information. The appropriate use of sensory testing during the various phases of product life will help products succeed, but unnecessary sensory testing of products or the inappropriate use of testing can result in product failure or failure of the sensory program.

DIVERSITY IN THE DETERMINANTS OF CONSUMER ACCEPTANCE OF PLANT-BASED FOODS

Davide Giacalone

Department of Green Technology, University of Southern Denmark, Odense, Denmark

e-mail: dg@igt.sdu.dk

Keywords: plant-based foods, alternative proteins, consumer research, individual differences, personal nutrition

Shifting toward more plant-based diets is increasingly recognized as essential for both human and planetary health. Consumer acceptance of plant-based foods is shaped by a complex and heterogeneous web of factors that go far beyond sensory experience alone. Against this background, this keynote presentation will highlight the diversity in individual responses to plant-based alternatives and argue for a more segmented, evidence-based approach to product development and promotion.

While sensory quality remains the foremost barrier to widespread adoption, acceptance is also influenced by person-related factors such as food neophobia, oral physiology, attitudes toward processing and sustainability, even political orientation. Cultural norms, perceived naturalness, price sensitivity, and previous product exposure further modulate consumer responses.

By integrating insights from my own research and the broader literature, the presentation emphasizes the need to move beyond simplistic, one-size-fits-all, approaches in consumer research on plant-based foods. The presentation will outline a roadmap for how these diverse factors can be taken into account – offering targeted strategies that, it is hoped, will enable plant-based foods to play a more meaningful role in dietary transition and broader sustainability goals.

PSYCHOGRAPHICS IN THE DEVELOPMENT OF HEALTHY AND SUSTAINABLE FOOD PRODUCTS

Erminio Monteleone

Sensory Lab. Unit DARGI, University of Florence, Firenze, Italy

e-mail: erminio.monteleone@unifi.it

Keywords: food neophobia, co-creation, sensory

The relationship between personality traits and food perception and preferences represents a burgeoning field of research with implications for nutrition, psychology, and consumer behavior. Several studies show that personality affects food choices and preferences, but the topic is still under-investigated. Much less is known about the role of personality in affecting sensory perception and food perception in particular.

Transitioning from meat-heavy diets to those that include more plant-based foods is widely recognized as beneficial for both human health and the global environment.

Food scientists currently face the challenge of facilitating the development of healthier and more sustainable food products. However, new foods are often rejected, as specific food related psychological traits such as food neophobia and sensitivity to disgust act as strong barrier of the acceptance of innovative solutions.

While there is broad consensus on the importance of involving consumers from the early stages of new product development, practical strategies for accounting for individual differences related to food psychographics are rarely addressed.

This talk aims to present applied studies on the topic, demonstrating how the measurement of psychological traits relevant to innovative, healthy, and sustainable food can be integrated into product development approaches based on co-creation and the jobs-to-be-done framework.

SENSORY SECRETS: TEXTURE'S INFLUENCE ON FOOD INTAKE, CONSUMER BEHAVIOUR, AND IMPLICATIONS FOR PRODUCT REFORMULATION

Paula Varela

Nofima, Norway

e-mail: paula.varela.tomasco@nofima.no

Keywords: texture perception, eating behavior, overeating, highly processed foods, consumer segmentation

The global rise in obesity and diet-related non-communicable diseases has been closely associated with the growing consumption of highly processed foods. These products are typically energy-dense, highly palatable, and easy to consume – factors that can contribute to excessive energy intake. Among the sensory characteristics of food, texture plays a particularly influential role in shaping preferences, aversions, and the quantity of food consumed. Modifying the structural and compositional properties of food offers a promising avenue to influence eating behavior while preserving consumer acceptance.

Key mechanisms such as satiation, eating rate, oral processing, and sensory exposure are known to affect energy intake. Research indicates that foods requiring more chewing – those that are harder or denser – tend to reduce intake compared to softer, more easily consumed alternatives. However, texture is a multidimensional attribute. Elements such as creaminess, particle size, and heterogeneity may also contribute to sensory appeal and consumption patterns.

Despite growing interest in this area, our understanding remains limited regarding how different consumer groups perceive and respond to various textural attributes. Individual differences in tactile sensitivity, texture preferences, and the psychological and cultural factors influencing eating behavior are not yet fully understood.

This presentation draws on findings from a series of consumer and sensory studies to examine the relationship between food processing and overconsumption. It focuses on the role of texture perception, tactile sensitivity, and behavioral responses across diverse consumer segments, offering insights into how food design can support healthier eating habits.

A MULTI-DIMENSIONAL APPROACH TO NEW FOOD DEVELOPMENT: EXAMINING THE INTERACTION OF SENSORY PROPERTIES, CONSUMPTION CONTEXT, AND CULTURAL SIGNIFICANCE

Laura Vázquez-Araújo[1,2], Elena Romeo-Arroyo[1], María Mora Gijón[1,2]

[1] *GOe Tech Center, Basque Culinary Center, Donostia-San Sebastián, Spain*

[2] *Faculty of Gastronomic Science, Basque Culinary Center, Mondragón Unibertsitatea, Donostia-San Sebastián, Spain*

e-mail: lvazquez@bculinary.com, eromeo@bculinary.com, mmora@bculinary.com

Keywords: gastronomy, real context of consumption, food design, culinary application

Sensory science plays a vital role in the process of developing new products (NPD), but, while designing new foods with specific sensory properties is important, achieving successful innovation in the food system requires a broader perspective.

Consumer segments have diverse needs beyond sensory expectations, including considerations for health, sustainability, convenience, price, and other extrinsic factors. In addition, considering consumption and cultural contexts can fundamentally reshape the new product development process. It is well known that the perception of a food product designed to be suitable to a particular consumption context and culture could be entirely different if assessed in a different scenario. Therefore, considering the interaction of contextual factors during the food design process is essential to optimize food design processes. Quantitative and qualitative consumer science methodologies are valuable for informing food designers in NPD, however, incorporating various stakeholders can additionally promote the contextual and cultural relevance of foods.

The present study examines new food design approaches that integrate context, paying particular attention to those where chefs and food artisans have made significant contributions. Due to their expertise in foods, ingredients and their application, cultural recipe adaptations, and food presentation, chefs and artisans could significantly contribute to food design by offering feedback that infuses new foods with cultural meaning and a distinct gastronomic identity. This presentation will show specific cases of food design processes, with examples from the SEASONED project, to underscore that understanding the interrelationships among culture, context, and food properties is crucial for achieving successful innovation in today's dynamic food landscape.

ORAL PRESENTATIONS

SENSORY EXPECTATIONS IN THE CO-CREATION PROCESS AS TOOLS FOR DEVELOPING PRODUCTS FOR PEOPLE WITH SPECIFIC DIETARY NEEDS

Artur Głuchowski[1], Katarzyna Świąder[2], Magdalena Zatorska[3], Krzysztof Klincewicz[3]

[1] *Department of Food Gastronomy and Food Hygiene, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[2] *Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[3] *Centre for Socially Responsible Innovations, Faculty of Management, University of Warsaw, Poland*

e-mail: artur_gluchowski@sggw.edu.pl, katarzyna_swiader@sggw.edu.pl, magdalena.zatorska@uw.edu.pl, kklincewicz@wz.uw.edu.pl

Keywords: sensory lexicon, sensory expectations, consumers, new food product development

Co-creation, which actively involves consumers in product development, is increasingly used in the food industry to create personalized, innovative products. This approach is especially valuable when designing food for groups with specific dietary needs.

This study explored how detailed sensory instruction in co-creation can empower untrained consumers to develop a sensory lexicon of expected vegan snack features.

The study group included 26 consumers (6 males, 20 females) avoiding animal-derived proteins, with an average age of 30 years (±5.7). They participated in five stages of co-creation, using the original methodology from the University of Warsaw, which was adapted to include a detailed sensory wheel covering appearance (color, size, shape, attractiveness), aroma, texture (e.g., softness, crispiness, brittleness, fluffiness, cohesiveness, fatty film), and taste.

Over 250 sensory expectations for ideal cereal-based vegan snacks were proposed, and 173 unique sensory descriptors were collected and analyzed. The untrained panel generated a highly diverse sensory vocabulary. Visually engaging features were strongly emphasized (n = 49 descriptors), with a preference for colorful, novel shapes. Aroma played a key role (n = 78), with panelists seeking fragrant products rich in bold spices, fresh herbs, and comforting bakery notes. Texture expectations (n = 59) reflected a desire for a balanced crunch-soft contrast and clean and convenient eating experiences. Flavor expectations (n = 72) leaned toward complex, often fusion-inspired combinations, especially sweet-savory or sweet-spicy pairings. There was also a notable demand for cheese-like flavors, suggesting a preference for familiar taste profiles.

Descriptors like herbal aroma and flavor, crunchy crust, soft crumb, and fresh bread aroma appeared across multiple sensory categories, highlighting their key role in shaping the ideal product's character.

This data offers valuable insight for product development, particularly in crafting appealing vegan snacks that blend aesthetics, textural contrast, and intense flavors. The study confirms that co-creation is an effective method for developing food products tailored to various consumer segments, including those with special dietary needs. The profile of sensory expectation can help to prepare a successful product.

Funding: *This research was conducted within the EIT Food RIS Consumer Engagement Labs project funded by the European Institute of Innovation and Technology (EIT), a body of the European Union*

AROMA – NOT JUST THE HEDONIC VALUE OF FOOD

Michaela Godyla-Jabłoński[1], Karolina Sobieraj[2], Monika Maćków[1], Natalia Pachura[3], Marta Klemens[4], Julia Wolska[4], Jacek Łyczko[4]

[1] *Department of Human Nutrition, Wrocław University of Environmental and Life Sciences, Poland*

[2] *Department of Applied Bioeconomy, Wrocław University of Environmental and Life Sciences, Poland*

[3] *Department of Environment Hygiene and Animal Welfare, Wrocław University of Environmental and Life Sciences, Poland*

[4] *Department of Food Chemistry and Biocatalysis, Wrocław University of Environmental and Life Sciences, Poland*

e-mail: michaela.godyla@upwr.edu.pl, monika.mackow@upwr.edu.pl, karolina.sobieraj@upwr.edu.pl, natalia.pachura@upwr.edu.pl; marta.klemens@upwr.edu.pl, 122508@student.upwr.edu.pl, jacek.lyczko@upwr.edu.pl

Keywords: appetite, volatile compounds, overweight and obesity, food

The population of emerging and highly developed societies, despite steadily improving quality of health care and overall standard of living, faces various challenges. Among them, weight management plays a significant role as it affects all communities. According to the latest WHO data, more than 61% of the world's adult population is overweight and obese, while 7.5% of children and adolescents also follow this trend. Both groups may exhibit appetite control problems, which can result in weight control. Therefore, we are looking for strategies that will support weight control strategies without causing unpleasant side effects. To this end, we have composed appetite control agents whose mechanism of action is based on odor stimulation. Based on a proof-of-concept study based on a questionnaire evaluation of the efficacy of appetite control agents, two prototypes were selected for a study in which actual food intake was monitored after exposure to the samples. Consumers indicated that samples with a pleasant, food-based aroma mainly increased their appetite, while samples with an irritating aroma could strongly reduce their appetite. During the study where the consumers were invited to smell a sample and have a meal, the reduction of food intake range 1–12% of total food weight.

Funding: *This research was funded by the National Centre for Research and Development, grant number LIDER XI programme no. LIDER/48/0191/L-11/19/NCBR/2020*

SHAPING THE SENSORY ATTRIBUTES OF SOUS-VIDE CHICKEN BREAST BY THE ADDITION OF NOVEL CONDIMENTS MIXES CONTAINING BLACKCURRANT POMACE

Małgorzata Korzeniowska, Grażyna Kowal

Department of Functional Food Products Development, Faculty of Biotechnology and Food Sciences, Wrocław University of Environmental and Life Sciences, Poland

e-mail: malgorzata.korzeniowska@upwr.edu.pl

Keywords: blackcurrant pomace, condiments, sous-vide, chicken breast, sensory properties

Natural low palatability of chicken breast meat along with its readiness to absorb robust and flavorful mixes, give a wide possibilities to moderate product's sensory attributes towards consumers expectations. Condiments mixes, consisting mainly of spices and herbs, can be enriched with selected food industry side-streams, including blackcurrant pomace, that can provide fiber and polyphenols but also it can create new sensory sensations during consumption.

The study aimed at creation the most sensory favorable conditions of marinated chicken breast meat with the use of novel condiments containing blackcurrant pomace.

Scope of research: (1) preparation and evaluation of condiments mixes; (2) application of the prepared condiments mixes to chicken breast meat under sous-vide treatment; (3) evaluation of sensory consumers acceptance and texture profiling; (4) evaluation of selected physicochemical properties, and (5) statistical analysis of the collected results.

Materials: chicken breast fillets (local market), blackcurrant pomace (MW FOOD Sp. z o.o., Poland).

Methodology: (1) sensory acceptance test (1-9 point scale) and Quantitative Descriptive Analysis (ISO 13299:2010), (2) marinade absorption, cooking loss, pH, color (CIELab, Minolta Ltd.) (3) Thiobarbituric acid reactive substance (Luciano et al., 2011), (4) Texture profile analysis (TPA) and cutting force (Kozioł et al., 2016, Zwick/Roell Z010, Germany), (5) ANOVA with Duncan test at $p < 0.05$ (Statistica 13.3).

The sous-vide chicken breast fillets were rated by consumers in the mid-range of the acceptance scale, with higher desirability for products with added blackcurrant pomace, and as well, black garlic and sun-dried tomatoes. Except for an appearance of meat samples, which was lower after condiments application, all analyzed sensory attributes i.e. flavor, taste, color, texture, were highly accepted by the consumers. The cutting force needed to completely break the sample

decreased along with a storage time, that implicated that tenderness of the meat was improved over time. The heat treatment and storage time of the samples significantly ($p < 0.05$) affected the brightness (L*) of the marinated and cooked meat. The addition of 15% of blackcurrant pomace caused a negative alteration of the meat samples in case of texture parameters, mainly gumminess and chewiness. The used marinades significantly ($p < 0.05$) reduced TBARS values in the samples during chilled storage.

Conclusions: The blackcurrant pomace, together with black garlic and sun-dried tomatoes as an additives, can be applied to sous-vide treated chicken breast meat with a positive effect on the consumers sensory acceptance, as well as physicochemical properties and storage stability.

THE POTENTIAL OF MOLD-DERIVED UMAMI – NATURAL FLAVOUR ENHANCERS IN EUROPE

Maciej Król

European Miso Institute, Belgium–Denmark–The Netherlands

e-mail: mac@misoinstitute.eu

Keywords: koji fermentation, umami, clean-label, green transition, natural flavour enhancer

Introduction: The shift toward plant-based diets in Europe has accelerated the development of alternative protein products. However, many meat analogues fall short in delivering depth of umami flavour which is critical for consumer satisfaction. This sensory gap is further aggravated by a lack of competencies in foodservice and culinary development, where limited knowledge of the use of natural flavour enhancers constrains innovation. Simultaneously, there is a growing demand for clean-label ingredients that support both public health goals and sustainability-driven procurement policies. At the same time, European food based dietary guidelines increasingly promote the use of legumes and other plant-based ingredients in both public and private food systems. However, the challenge remains: how to meet these sustainability goals without compromising on flavour or consumer acceptance.

Objective: This presentation aims to explore the role of koji-derived (*Aspergillus* spp.), mold-fermented flavour enhancers as a natural, clean-label solution to the umami gap in plant-based foods, and to assess their potential within European food systems.

Scope of research: The research focuses on the European market, with particular attention to the dynamics within foodservice and commercial food sector, clean-label consumer trends, and the rise of natural fermentation as a flavour development strategy.

Material and methodology: The study is based on desk research conducted by the European Miso Institute, including analysis of scientific literature, regulatory frameworks, industry reports, and interviews with local producers and stakeholders across Europe. A commercial mapping was used to identify the operational and sensory science challenges in upscaling koji-derived flavor enhancers' production.

Results: Findings indicate increasing interest in mold-fermented umami enhancers from producers, culinary professionals, and consumers. However, key limitations remain, including scaling issues, limited culinary application skills, and low consumer familiarity in certain markets, among others. Cross-cultural perceptions of fermentation and mold (filamentous fungi) also influence acceptance and market penetration.

Conclusions: Koji-derived flavour enhancers hold strong potential to bridge the sensory gap in plant-based foods while meeting clean-label expectations. To unlock this potential, more support for niche innovation producers in exposing their ingredients to the market is needed. Moreover, we recommend investing in knowledge transfer between producers, scientists, and foodservice professionals, and expanding sensory education to better integrate fermentation within culinary training. By addressing these structural barriers, the food sector can move toward more sustainable, and palatable plant-based solutions.

INCLUSIVE DESIGN AS A TOOL FOR PRODUCTS IMPROVEMENT

David López-Lluch[1], Luis Noguera-Artiaga[1], Hanán Issa-Issa[1], Ángel A. Carbonell-Barrachina[1], Esther Sendra-Nadal[1], Irene Arias-Navarro[2]

[1] *Research Group "Food Quality and Safety (CSA)", Centro de Investigación e Innovación Agroalimentaria y Agroambiental, University Miguel Hernández of Elche, Orihuela, Alicante, Spain*

[2] *Department of Agri-Environmental Economics, University Miguel Hernández of Elche, Orihuela, Alicante, Spain*

e-mail: david.lopez@umh.es

Keywords: inclusive, design, consumer, disabled

Approximately 27% of the EU population aged 16 and over, equating to an estimated 101 million individuals or one in four adults, lives with a disability, according to Eurostat projections. The International Convention on the Rights of Persons with Disabilities (Decision 010/48/EC) defines "persons with disabilities" as those with long-term physical, mental, intellectual, or sensory impairments that, when interacting with societal barriers, hinder their full and equal participation.

The European Charter of Fundamental Rights reinforces this by guaranteeing the "equality of persons before the law" (Article 20), "prohibiting all discrimination, including disability" (Article 21), and mandating a "high level of consumer protection" (Article 38). Specifically, Article 26 emphasizes the "integration of disabled persons", requiring the EU to ensure measures that support their autonomy, social and professional integration, and community participation.

The EU defines "consumers" functionally, as "natural persons acting outside their business or professional activity". This broad definition encompasses people with disabilities as market participants, purchasing goods and services. The Court of Justice of the European Union (CJEU) recognizes consumer protection as an objective of "general interest" (Case C-58/08, Vodafone).

Despite these legal frameworks, people with disabilities frequently encounter discrimination due to unmet needs. Their rights as citizens and consumers are often compromised by societal oversights. Product design plays a crucial role in fostering inclusion or exclusion. We often take for granted accessibility features like entry ramps, Braille signage, accessible door handles, wider public toilets, easy-open packaging, and tactile paving, and only recognize their importance when they are absent.

This communication explores the systemic neglect of disabled persons' needs in product and service design. Paradoxically, addressing these needs can lead to improved products and services for everyone. Finally, a pattern for inclusive design is proposed.

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CROSS-NATIONAL CONSUMER INSIGHTS ON HERBAL-INFUSED RECONSTITUTED FRUIT BEVERAGES: A COMPARATIVE STUDY OF POLAND AND SWITZERLAND

Anna Michalska-Ciechanowska[1], Nesa Dibagar[1], Jessica Brzezowska[1], Laëtitia Nicolas[2], Wilfried Andlauer[2], Isabel Casanova Martinez[3]

[1] *Department of Fruit, Vegetable and Plant Nutraceutical Technology, Wrocław University of Environmental and Life Sciences, Poland*

[2] *Institute of Life Technologies, University of Applied Sciences and Arts Western Switzerland (HES-SO Valais Wallis), Sion, Switzerland*

[3] *Agrifood Technology Department, University Miguel Hernández of Elche, Orihuela, Alicante, Spain*

e-mail: anna.michalska@upwr.edu.pl, nesa.dibagar@upwr.edu.pl, jessica.brzezowska@upwr.edu.pl, laetitia.nicolas@hevs.ch, wilfried.andlauer@hevs.ch, isabel.casanova@goumh.umh.es

Keywords: fruit-based drinks, plant-based powders, fortification, sensory perception, intensity analysis

The growing demand for functional beverages has led to the development of fruit-based drinks fortified with plant-derived ingredients. Given this, consumer sensory perception of fruit-herbal beverages reconstituted from powdered formulations based on rosehip and haskap berry juices and enriched with infusions of white mulberry and hawthorn, respectively, was tested. The compositions were therefore spray-dried into powders using an inulin-trehalose mixture (1:1; w/w) as a carrier. For the sensory evaluation, powders were reconstituted with water (20 mg/ml). The study involved 94 Polish and 76 Swiss adult participants and investigated how national factors influence consumers' sensory perception of functional plant-based beverages. Participants rated the intensity of color, aroma, sweetness, and sourness, as well as overall liking. Among Polish consumers, rosehip beverage with white mulberry infusion was rated as "just right" or "almost enough", with a significant increase in overall liking compared to the un-enriched version. In contrast, Swiss respondents, favored the color and sweetness of the enriched rosehip beverage, but identified significant differences in aroma intensity. For the haskap berry beverage with the addition of hawthorn infusion, Polish participants reported significant differences in aroma and sweetness, while Swiss respondents primarily noted variations in aroma intensity, frequently rating it as "not enough at all". Despite no significant difference in overall liking between enriched and un-enriched versions in either population, both Polish and Swiss consumers demonstrated purchase intention for the herb-enriched haskap berry variant. Finally, color and sweetness emerged as primary factors influencing among Polish consumers,

whereas aroma intensity among Swiss respondents. These results highlight the substantial role of national factors in shaping sensory perception and consumer preferences, providing critical insights for the development and targeted marketing of reconstituted plant-based beverages.

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COMPARISON OF SENSORY QUALITY PERCEPTIONS OF GLUTEN-FREE COOKIES EVALUATED BY CELIAC AND NON-CELIAC PEOPLE

Daria Musiienko, Lenka Kouřimská, Diana Chrpová

Department of Microbiology, Nutrition and Dietetics, Czech University of Life Sciences Prague (CZU), Praha – Suchdol, Czech Republic

e-mail: musiienko@af.czu.cz

Keywords: celiac disease, gluten-free products, sensory evaluation, consumer acceptance, bakery products

Celiac disease affects approximately 1% of the global population and requires strict adherence to a gluten-free diet. Despite the expanding gluten-free product market, sensory quality remains a significant challenge. Individuals with celiac disease, who are restricted from consuming gluten-containing cereals, may have different sensory experiences compared to non-celiacs, which could influence their product evaluations. This study aimed to compare the sensory perception of gluten-free cookies between consumers with and without gluten-related disorders. Three types of biscuits (based on coconut shavings, buckwheat flour, and a commercial gluten-free mix) were assessed by 100 participants: 48 with celiac disease or gluten intolerance and 52 without gluten-related dietary restrictions. The sensory evaluation followed a profiling method. Results showed no statistically significant differences between the two consumer groups in their overall sensory assessment. The coconut-based cookie received the highest ratings, while the buckwheat variant was least preferred. The findings suggest that non-celiacs can reliably evaluate the sensory properties of gluten-free bakery products, as long-term exclusion of gluten does not considerably alter sensory perception.

SENSORY ASPECTS IN THE DESIGN OF LOW-GI CATERING MEALS USING THE CO-CREATION PROCESS

Katarzyna Świąder[1], Artur Głuchowski[2], Mariusz Żuk[3], Magdalena Zatorska[4], Krzysztof Klincewicz[4]

[1] *Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[2] *Department of Food Gastronomy and Food Hygiene, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[3] *Kuchnia Wikinga – Wschodni Front Sp. z o.o., Białystok, Poland*

[4] *Centre for Socially Responsible Innovations, Faculty of Management, University of Warsaw, Poland*

e-mail: katarzyna_swiader@sggw.edu.pl, artur_gluchowski@sggw.edu.pl, mariusz.zuk@kuchniavikinga.pl, magdalena.zatorska@uw.edu.pl, kklincewicz@wz.uw.edu.pl

Keywords: sensory evaluation, co-creation, consumers, new food product development, catering

The increasing demand for tailored nutrition has led to a surge in innovative approaches in the development of functional meals. Among them, the co-creation process, involving active consumer participation, has emerged as a promising strategy to align sensory acceptability with specific dietary requirements. This study focuses on the application of sensory science within a co-creative framework aimed at designing dietary catering meals with a low glycemic index (GI), specifically adapted for individuals limiting gluten and/or lactose in their diets.

The participatory process involved structured consumer workshops facilitated by academic and industry partners. Participants engaged in several stages: persona development, sensory expectations mapping, identification of product gaps, ideation of meal concepts, and preliminary product assessment. Special attention was paid to sensory attributes such as appearance, texture, flavour, and aroma – factors crucial to acceptance in populations with metabolic or digestive sensitivities.

Outcomes indicate that sensory preferences strongly influence product acceptance, especially in functionally restricted diets. The integration of sensory evaluation in the co-creation process allowed for iterative refinement of meal concepts, increasing their market relevance and user satisfaction.

The project highlights the value of consumer-driven sensory insights in functional food development. It also demonstrates that co-creation can effectively guide the design of health-oriented, sensory-pleasing meals, fostering collaboration between academia, industry, and end-users.

Such approaches may significantly advance innovation in personalized nutrition catering and public health nutrition solutions.

Funding: *This research was conducted within the EIT Food RIS Consumer Engagement Labs project funded by the European Institute of Innovation and Technology (EIT), a body of the European Union*

THE INFLUENCE OF LAVENDER AND LEMON ESSENTIAL OILS CONSTITUENTS ON ENVIRONMENTALLY SUSTAINABLE CONSUMER CHOICES

Julia Wolska*, Karolina Sobieraj, Marta Klemens, Magdalena Węgrzyn, Jacek Łyczko

Department of Food Chemistry and Biocatalysis, Wrocław University of Environmental and Life Sciences, Poland

e-mail: 122508@student.upwr.edu.pl*, marta.klemens@upwr.edu.pl, jacek.lyczko@upwr.edu.pl

Keywords: decision-making, sensory stimuli, sustainability, aroma marketing, gas chromatography

Introduction: Ambient odors may be natural, but in many cases, there are introduced to the consumer surroundings artificially as perfumes, air fresheners or part of cleaning products. Within those products, commonly are used scents related to lavender or lemon, which were found as stimuli with opposite influence. Lavender aroma notes has calming and reducing anxiety effects, while lemon aroma notes bring excitement and refreshment.

Objective: Therefore, the question was raised, if the daily exposure on those different aromas and their constituents may influence the human behavior in terms of consumer decision impact on the environment.

Scope of research: The research focuses on exploring the influence of fragrance components on environmentally sustainable decision-making by consumers. Specifically, the study examines the impact of various aroma compounds, on consumer choices in relation to sustainability.

Material and methods: To investigate that a consumer questionnaire study with over 100 participants was performed. The consumers, during the exposition on lavender essential oil, lemon essential oil and prepared substitutes of essential oils, with using different volatile organic compounds, answered the questions related to food-related choices (7 questions), communication choices (5 questions), clothing, textile, and gadget choices (7 questions), and emotions (6 questions), which were evaluated in the light of environmentally sustainable decisions using the statistical analysis. The second part of the research included sensory panel to evaluate the substitutes.

Results: A statistically significant difference was found in environmentally sustainable decisions, with substitutes containing Limonene and compounds composing LemEOs receiving lower scores compared to the control group and LavEOs.

Conclusions: The obtained results suggest that it is not necessarily the fragrance profile itself, but rather its composition – the specific molecules – that may influence the environmentally sustainable decisions made by consumers. However, further research on this topic is needed to draw more definitive conclusions and better understand the underlying mechanisms. This area of study holds potential for providing deeper insights into how product formulations can shape consumer behavior toward sustainability.

POSTER PRESENTATIONS

SENSORY-DRIVEN OPTIMIZATION OF FISH AND SEAFOOD BROTHS WITH A FOCUS ON FOOD SAFETY

Isabel Casanova-Martínez, Marina Cano-Lamadrid, Esther Sendra-Nadal , Ángel A. Carbonell-Barrachina

Instituto de Investigación e Innovación Agroalimentaria y Agroambiental, Universidad Miguel Hernández de Elche, Orihuela, Alicante, Spain

e-mail: icasanova@umh.es

Keywords: stock, soup, marine, sensorial techniques

Fish and seafood broths (marine broth), traditionally used in Spanish cuisine as a base for rice dishes like *paella* or pasta such as *fideuà*, are typically prepared from fish and shellfish by-products, including heads and bones. These broths represent a sustainable use of marine resources and are a rich source of valuable nutrients such as collagen and omega-3 fatty acids. Also, these parts could present contaminants such as heavy metals and metaloids and migrate into the broth. During heating, proteins, fats, sugars and other substances in the muscle are gradually dissolved and degraded, giving the broth a specific sensory and nutritional quality. The sensory quality of marine broth is also determined by different factors such as the species used and its concentration. Inadequate cooking techniques, such as prolonged boiling, can cause rancidity and undesirable flavors in the product and can also alter the nutritional composition and generate losses of vitamins and minerals. Ensuring the safety of marine broth requires rigorous control of preparation techniques, maintaining sensory quality loss. Therefore, the aim of this study was to compile and critically analyze the existing literature on the sensory evaluation and optimization of marine broths. The review of this study was performed following the PRISMA extension (PRISMA-ScR). A comprehensive literature search (Scopus and ScienceDirect) was performed using as keywords several concepts (fish, broth, stock, soup, seafood, sensory, techniques) within the title, abstract and keywords. The search strategy was the same for the two databases, consulted in April 2025, the search period established was the last 13 years. Fifty results were obtained and, after screening, 6 articles were selected, as review articles and research articles without sensory analysis were eliminated. The low number of results is attributed to the limited research on this subject, including variables such as regions and other cultural and technological factors. In 100% of the articles, a descriptive analysis of the marine broths was performed with a trained panel of at least 10 tasters, while 16.7% were consumer hedonic studies with 100 Indonesian consumers. Since only in one study both hedonic and descriptive analysis, were performed. Of the selected articles, only in 16.7% was sensory analysis performed exclusively, while in the rest of the studies, in addition to the sensory study, different physico-

chemical analyses were performed, using HPLC in one study and GS-MS in 33.3% of the studies. As a conclusion the techniques observed will probably be used to develop marine broths by selecting fish and shellfish species, cooking times and temperatures, maintaining nutritional and functional quality but considering food safety aspects such as levels of heavy metals and metalloids. It would also be interesting to propose sensory discrimination tests to help optimize the development of new fish broths.

APPLICATION OF NON-*SACCHAROMYCES* YEASTS FOR LOW-ALCOHOL BEER PRODUCTION

Monika Cioch-Skoneczny, Krystian Klimczak, Aneta Ciosek, Aleksander Poreda

Department of Fermentation Technology and Microbiology, University of Agriculture in Kraków, Poland

e-mail: monika.cioch@urk.edu.pl

Keywords: beer, alcohol-reduced, non-*Saccharomyces*, yeast

In recent years, consumer interest in healthier food products has increased, including a growing demand for alcohol-reduced beers. These products have now gained a substantial market share, and manufacturers are constantly looking for new ways to introduce beers that could capture consumer attention. The methods used to produce alcohol-reduced beers can be divided into two categories: physical and biological. The former requires costly equipment, while the latter does not. However, a major drawback of both method groups is their inappropriate sensory characteristics – namely, wort off-flavors and a lack of fruity aroma, which can be often masked by an addition of flavoring agents, such as fruit juices. However, the industry is looking for new ways to obtain beers with better sensory characteristics.

An interesting example of biological methods is the utilization of yeast strains that are unable to utilize maltose, the main sugar found in brewer's wort. These strains allow for the direct production of alcohol-reduced beers. The maltose-negative trait is often observed in yeast strains belonging to genera other than *Saccharomyces*. These non-*Saccharomyces* strains were for a long time considered unwanted microflora in the brewing industry, but this view has begun to shift. The implementation of such yeasts in the brewing process could facilitate the production of alcohol-reduced beers. These yeasts often have different production profiles of volatile compounds, which could allow them to produce beers with unique sensory characteristics. Additionally, such yeasts often have a higher ability for biotransformation, which might further promote their usefulness in obtaining flavorful beverages. Given the massive variety of strains other than *Saccharomyces* yeasts, this opens new possibilities in the brewing industry. The development of such strains could be another tool in the brewers' toolkit to obtain beverages with unique and varied flavors.

The aim of this study was to evaluate the suitability of selected non-*Saccharomyces* yeast strains for the production of alcohol-reduced beers. The evaluated yeasts were strains of *Kluyveromyces lactis* MG971263, *Metschnikowia pulcherrima* MG971247, *M. pulcherrima* MG971250 and *Torulaspora delbrueckii* MG971248. Commercially available yeasts aimed at the production of

alcohol reduced beers – *S. cerevisiae* LA-01 were used as a control. The strains were used to ferment a wort with an extract of 9.8 °Plato. The resulting beers were analyzed for their physicochemical properties and subjected to a sensory analysis.

The non-*Saccharomyces* yeast allowed the researchers to obtain beers with an alcohol content in the range of 0.5–1.05%. Noticeably, each of beers had too high pH value, emphasizing the importance of controlling pH, when strains aimed at the production of alcohol-reduced beers are used. Sensory analysis revealed that each strain imparted distinct flavor characteristics. Among the evaluated strains, beers produced with strains of *M. pulcherrima* MG971250 and *T. delbrueckii* MG971248 were rated best.

These results highlight the varied potential of specific yeast strains in producing alcohol-reduced beers with favorable physicochemical and sensory profiles. In particular, *M. pulcherrima* MG971250 and *T. delbrueckii* MG971248 strains demonstrated the most promising characteristics, indicating their potential for further use in commercial alcohol-reduced beer production.

NON-*SACCHAROMYCES* YEAST IN THE PRODUCTION OF BEER MADE WITH THE ADDITION OF SELECTED MEDICINAL PLANTS

Aneta Ciosek, Julita Jakubczyk, Monika Cioch-Skoneczny

Department of Food Technology, University of Agriculture in Kraków, Poland

e-mail: a.ciosek@urk.edu.pl

Keywords: non-*Saccharomyces* yeast, medicinal plants, functional beer, sensory analysis

In recent years, the brewing industry has seen a growing interest in the use of alternative yeast strains and functional ingredients to meet consumer demand for innovative, health-oriented beer products. While *Saccharomyces cerevisiae* remains the primary yeast used in fermentation, *non-Saccharomyces* yeasts are increasingly explored for their potential to enrich sensory profiles and create beers with unique functional properties. Medicinal plants, known for their bioactive compounds, offer additional health benefits and flavor diversity when added during brewing.

The objective of this study was to evaluate the feasibility of using selected *non-Saccharomyces* yeast strains in the production of beer supplemented with chosen medicinal plants. The research focused on the impact of these yeasts and plant additives on fermentation dynamics, chemical composition, sensory characteristics, and potential health-promoting properties of the final product. The experimental scope included laboratory-scale fermentation trials using selected *non-Saccharomyces* strains – *Torulaspora delbrueckii* (MG971248) and *Kluyveromyces lactis* (MG971263) and medicinal plant additives such as spotted honeysuckle (*Lonicera periclymenum*), and common vervain (*Verbena officinalis*). A commercial *Saccharomyces cerevisiae* strain (Safale US-05) served as the control. Analytical methods included measurement of basic fermentation parameters (extract, alcohol content, pH), free amino nitrogen content, and sensory analysis conducted by a trained panel.

The results showed that the use of *non-Saccharomyces* yeasts, in combination with medicinal plant additives, resulted in beers with desirable sensory profiles, moderate alcohol levels, and good physicochemical stability. The inclusion of herbs contributed both to functional potential and unique flavor characteristics.

In conclusion, the use of *non-Saccharomyces* yeasts and selected medicinal plants presents a viable and promising direction for innovation in the brewing industry, aligning with current market trends toward health-focused and differentiated beer products.

THE USE OF SENSORY ANALYSIS IN HONEY QUALITY EVALUATION

Małgorzata Dżugan, Michał Miłek, Monika Tomczyk

Department of Chemistry and Food Toxicology, Institute of Food Technology and Nutrition, Faculty of Technology and Life Sciences, University of Rzeszów, Poland

e-mail: mdzugan@ur.edu.pl

Keywords: honey, variety, sensory profile, organoleptic testing, odor

Sensory analysis of honey involves evaluating its organoleptic properties using human senses, which include visual, olfactory, gustatory, and tactile characteristics. This method can be used as a complement to physico-chemical and pollen analyses to determine honey quality and botanical origin, verify the absence of defects and consumer preferences. While the previously applicable Polish standard PN-88/A-77626 contained a detailed description of the organoleptic characteristics of varietal honeys, in the current regulations this aspect of honey quality assessment is practically omitted. Meanwhile, the use of sensory analyses is systematically developed in other European countries. Thus, the aim of the work is to present the benefits of using sensory analysis in the classification of domestic honeys.

General requirements for tasting procedures of honey are well defined in controlled experimental protocols, including statistical techniques for processing the results. The sensory descriptions of main European monofloral honeys have been established regarding the visual evaluation of color and crystallization, sweetness and aroma as well as texture attributes like granularity and viscosity. The common descriptors set of olfactory analysis is particularly broad and includes the assessment of aroma intensity and characteristics. During evaluation various techniques such as descriptive analysis, quantitative descriptive analysis or profile methods are applied. Proper application of these methods allows to assess honey quality which influences consumer purchasing decisions. A key condition for the usefulness of sensory analysis is a well-prepared team of assessors, selected and trained in the used method. The panel members must follow the procedures and principles of tasting when assessing and reporting the sensory characteristics of honey and confirming the absence of defects.

In conclusion, the diversity of sensory attributes of varietal honeys pose significant challenges in the sensory analysis. While the assessment of some visual characteristics, including color, can be carried out instrumentally, the assessment of the olfactory-gustatory characteristics of honey is extremely important. Spreading the sensory analysis in the quality control of domestic honeys could limit the scale of adulteration in the honey market. However, this requires adapting the descriptions of organoleptic features for domestic varieties of monofloral honeys.

Moreover, beekeepers should also acquire knowledge about honey tasting, tasting vocabulary and the aromatic and taste aspects of the main types of honey and their defects in order to avoid incorrect declaration of the honey variety on the label.

SENSORY PROPERTIES OF CHOCOLATES WITH DIFFERENT MILK SUBSTITUTES

Maja Hrowatić, Joanna Oracz, Dorota Żyżelewicz

Institute of Food Technology and Analysis, Faculty of Biotechnology and Food Sciences, Lodz University of Technology, Poland

e-mail: dorota.zyzelewicz@p.lodz.pl

Keywords: chocolate, vegan milk substitutes, panel sensory analysis, instrumental sensory analysis

Consumers value chocolate not only for the presence of bioactive components beneficial to human health, but especially for its unique sensory attributes. One of the main raw materials used in the production of milk and white chocolates is milk. However, there are consumers who, for health or lifestyle reasons, cannot or do not want to consume milk. Following the growing demand for vegan products, the assortment and availability of these products is growing every year. The choice of milk substitute (e.g., plant-based beverages, plant protein preparations of various botanical origins, ground seeds) for vegan products depends on the type of target finished product. In this regard, the aim of the study was to select suitable milk substitutes to obtain vegan chocolates with acceptable organoleptic properties.

The scope of the study was to obtain vegan chocolates and a reference – milk chocolate, sweetened with sucrose or xylitol, and then determine their sensory properties by performing panel sensory evaluation (5-point rating scale, 15 panelists) and instrumental taste and aroma analysis using electronic: tongue and nose (Alpha MOS, Toulouse, France). Chocolates containing 20% milk or milk substitute were obtained on a PROMET (Lodz, Poland) quarter-scale chocolate production line. To prepare the chocolates, pistachios and/or plant protein preparations were used: fava beans, hemp, pumpkin seeds, a mixture of pea, brown rice and pumpkin seeds.

The study revealed that the chocolate with fava bean protein obtained the highest overall score in the panel organoleptic evaluation (4.44 points). The flavor analysis carried out using the e-tongue demonstrated differences between the intensity of sensation of individual flavors during consumption of the chocolates tested. In the chocolate best rated by the panelists, sour flavor was the least intense (4.1 IU) and bitter flavor was the most intense (6.7 IU). All flavors (sour, metallic, salty, umami, sweet, bitter) except spicy were experienced to a lesser degree in this sample than in the control chocolate. Analysis of the aroma components using the e-nos

showed that among the identified volatile compounds, propanal (pungent and ethereal odor) and acetaldehyde (ethereal, fresh, fruity, pungent scent) were present in the highest concentration. The other aroma components varied according to the raw materials used to obtain the chocolates.

Studies showed that it is possible to use milk substitutes in the form of various protein preparations for the production of vegan chocolates. However, the organoleptic properties of the finished product depend on the preparation used.

AROMATIC AND PHENOLIC COMPOUNDS AND SENSORY PROFILE OF *FONDILLÓN*, THE MOST IMPORTANT WINE OF THE ALICANTE PROTECTED DESIGNATION OF ORIGIN

Hanán Issa-Issa, Luis Noguera-Artiaga, David López-Lluch, Ángel A. Carbonell-Barrachina

Centro de Investigación e Innovación Agroalimentaria y Agroambiental, Universidad Miguel Hernández de Elche, Orihuela, Alicante, Spain

e-mail: hissa@umh.es, lnoguera@umh.es, david.lopez@umh.es, angel.carbonell@umh.es

Keywords: Alicante wine, descriptive sensory analysis, *Monastrell*, odor active compounds, phenolic compounds

Fondillón is a unique Alicante wine, which main characteristics are (i) the over-ripening of the *Monastrell* grapes on the vine; (ii) its biological fermentation (because the alcohol comes exclusively from the grapes; it contains no additives); (iii) the minimum permitted alcohol level of 16%; and, (iv) its age prior to marketing, which must be of at least 10 years. *Fondillón* is protected within the Alicante Protected Designation of Origin (DOP Alicante) for wine. The main objectives of this research were to: (i) identify the phenolic compounds and the active odorants, and (ii) establish a general sensory profile of this special wine. The samples were analyzed using liquid chromatography (LC-MS-MS) and gas chromatography with an olfactometry port (GC-MS, GC-MS-O), while the sensory profile was performed using the official sensory panel of the Alicante PDO, which works under the ISO 17065 norm. Twenty-five phenolic compounds were identified and quantified, with protocatechuic and gallic acids being the predominant molecules. In addition, 56 volatile compounds were identified, predominantly esters and alcohols (e.g., ethyl lactate and isoamyl alcohol). Of these 56, 22 were identified as odor active compounds, including, phenylethyl alcohol (floral) and diethyl succinate (fruity). Finally, it was observed that the sensory profile of *Fondillón* was characterized by a high alcohol intensity, with fruity and toasted notes and a long persistence.

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SENSORY METHODS APPLICATION IN PRODUCTS ENRICHED WITH INSECT FLOUR EVALUATION

Danuta Jaworska[1], Roman Datchenko[1], Radosław Bogusz[2], Łukasz Dominiak[2], Agata Marzec[2]

[1] *Department of Food Gastronomy and Food Hygiene, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[2] *Department of Food Engineering and Process Management, Institute of Food Science, Warsaw University of Life Sciences, Poland*

e-mail: danuta_jaworska@sggw.edu.pl, s213072@sggw.edu.pl, radoslaw_bogusz@sggw.edu.pl, s222795@sggw.edu.pl, agata_marzec@sggw.edu.pl

Keywords: bakery, insect flour, sensory methods, consumer

Introduction: Protein production from insects is more beneficial for the environment than other kinds of proteins. Their nutritional value, especially in terms of protein, fat and fiber, is relatively high. Despite this, in Europe and Poland, cultural barriers still exist to consuming insects.

Objective, scope of research: The study aimed to assess the possibility of enriching selected bakery products with insect flour based on sensory criteria. This research is consistent with the concept of sustainable use of food raw materials.

Material and methods: As part of the work, the quality of bread, including baguettes and muffins, with the addition of insect flour in amounts up to 10%, was optimized. The studied material was compared to a control sample, which was bread and muffins without insect flour. The panel discussion method, the QDA method and sensory consumer research were used to evaluate the tested products.

Results: The obtained results of the research indicate the possible addition of insect flour. In addition, the results showed that despite a positive attitude to experimentation, only a small part of consumers who take part in the experiment would agree to eat insects, despite the beneficial philosophy of impact on the environment.

Conclusion: The implementation of insects in consumer diets requires further education and a change in consumer attitudes.

APPLICATION OF PLANT POMACES IN CREATION OF BREAKFAST SPREADS SENSORY PROPERTIES

Szymon Juchniewicz, Katarzyna Leicht, Małgorzata Korzeniowska

Department of Functional Food Products Development, Wrocław University of Environmental and Life Sciences, Poland

e-mail: szymon.juchniewicz@upwr.edu.pl

Keywords: sensory, plant spreads, by-products

The production of fruit and vegetable products is increasing, which also creates more side-stream materials such as pomace generated during pressing juices. These materials are often disposed, even though they are rich in nutrients. This study aimed to develop plant-based breakfast spreads using fruit and vegetable pomaces and to evaluate their sensory quality. Three types of spreads were made using vegetables and fruits such as carrot, sweet potato, paprika, beetroot, raspberry, banana, and sour cherry. Cranberry, apple, chokeberry pomaces, and buckwheat husk flour were added at 1, 2 and 3% to improve texture and nutrition. All samples were pasteurized at 85°C for 10–20 minutes and stored at 4–8°C. A trained sensory panel (n = 8) tested the spreads on day 1 and day 5. They evaluated taste, smell, color, and texture, and gave scores for overall acceptability. In addition, pH, color (L*, a*, b*), and viscosity were measured instrumentally. The results showed that pasteurization time had a clear effect on pH and color. All spreads were easy to spread and had smooth textures. However, spreads with raspberries scored lower because of the small seeds. The most acceptable product was made with baked paprika, carrot, and sweet potato, with 2% buckwheat husk flour. This spread had a creamy texture, sweet and slightly savory flavor, and an attractive reddish color. Another well-rated sample contained carrots, beetroots, and 26.66% apple pomace. This research shows that adding fruit and vegetable pomaces to spreads is a good way to improve sustainability and create tasty and healthy products. Sensory qualities – especially texture, flavor, and appearance – were most important for product acceptance.

Funding: *This work is part of the project SEASONED – Advances in Food Sensory Analyses of Novel Foods (www.seasonedproject.eu), which received funding by the European Union under the Horizon Europe 'Widening participation and spreading excellence' program (Grant agreement 101079003)*

EFFECT OF FUNCTIONAL ADDITIVES AND TRANSGLUTAMINASE ON SENSORY PROPERTIES AND TEXTURE OF BOLOGNESE SAUCES – ANALYSIS OF RECIPE VARIANTS

Szymon Juchniewicz, Wiesław Kopeć

Department of Functional Food Products Development, Wrocław University of Environmental and Life Sciences, Poland

e-mail: szymon.juchniewicz@upwr.edu.pl

Keywords: Bolognese sauce, sensory analysis, texture profile, transglutaminase, tomato fiber, functional additives

The aim of this study was to evaluate the effects of selected functional additives – flaxseed, vegetable fiber, and tomato fiber – and the enzyme transglutaminase (TGA) on the sensory properties and texture of Bolognese sauces. Eight sauce variants were analyzed, including a control sample and those enriched with TGA and fiber additives. Sensory evaluation was conducted using a traditional 5-point acceptance scale, while texture was assessed using a 10-point profiling method.

Sauces containing tomato fiber, both with and without TGA, received the highest overall sensory scores. These samples also performed best in terms of color, texture, and sweetness. The addition of fiber, especially tomato fiber, improved the structural consistency of the sauces, leading to increased density and viscosity. All variants showed low deliquescence on the sensory scale and demonstrated favorable rheological viscosity characteristics.

In contrast, sauces with flaxseed and TGA received the lowest overall scores, including the poorest texture ratings and high spreadability. The combination of TGA with psyllium fiber was found to reduce texture quality, despite a higher starch content (2.5%). Although some variants did not meet expectations regarding texture, they still achieved an acceptable level of overall sensory quality.

In conclusion, Bolognese sauces containing tomato fiber showed the most favorable sensory and textural attributes. While TGA improved color and texture stability, its combination with certain additives, such as psyllium, requires further optimization. These findings indicate that it is possible to enhance the functional value of Bolognese sauces without negatively affecting consumer acceptance.

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HOW DOES PRESENCE OF LIPOPHILIC SUBSTANCES CHANGE THE AROMA OF MINT AFTER DRYING PROCESS?

Marta Klemens[1], Antoni Szumny[1], Angel Calin-Sanchez[2], Helene Hopfer[3], Jacek Łyczko[1]

[1] *Department of Biocatalysis and Food Chemistry, Wrocław University of Environmental and Life Sciences, Poland*

[2] *Department of Agricultural and Food Technology, Universidad Miguel Hernández de Elche, Spain*

[3] *Department of Food Science, The Pennsylvania State University, USA*

e-mail: marta.klemens@upwr.edu.pl, jacek.lyczko@upwr.edu.pl, antoni.szumny@upwr.edu.pl, acalin@umh.es, hxh83@psu.edu

Keywords: mint, volatile compounds, lipophilic substances, drying process, aroma

The drying process significantly affects the aroma of herbs, including mint, which is valued for its characteristic fresh and aromatic fragrance. The aim of the study was to understand how the presence of lipophilic substances alters the aroma of mint after the drying process. Mint samples were analyzed using the HS-SPME technique, and then identified and characterized by gas chromatography coupled with mass spectrometry (GC-MS) to isolate and analyze volatile compounds. A sensory evaluation was then conducted by a panel of experts to assess the intensity and aromatic characteristics of the samples. The results showed that mint samples containing lipophilic substances had a more intense and aromatic fragrance compared to those without these substances. Statistical analysis of the sensory data was performed in R, which confirmed that the presence of lipophilic substances contributes to a stronger and more pronounced aroma. The obtained results highlight the role of lipophilic substances in enhancing the aromatic quality of dried mint, which may have applications in the food, cosmetic, and pharmaceutical industries.

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THE EFFECT OF PLANT PROTEIN APPLICATION ON SENSORY PROPERTIES OF MERENGUES DURING STORAGE

Martyna Klimczak[1]*, Justyna Jaczun[1], Karolina Pawełczyk[1], Inga Klimczak[2], Maria Sielicka-Różyńska[2]

[1] *Scientific Student Association of Food Quality and Safety SPECTRUM, Poznan University of Economics and Business, Poland*

[2] *Department of Food Quality and Safety, Poznan University of Economics and Business, Poland*

e-mail: 93011@student.ue.poznan.pl*, inga.klimczak@ue.poznan.pl,
maria.sielicka-rozynska@ue.poznan.pl

Keywords: plant protein, meringue, sensory profiling, texture

Meringue, which is one of the scaffolding of culinary arts, basically consists of whipped egg white and sugar. The structure of typical meringues is based on the air entrapped in the beaten egg whites, that creates characteristic texture, rheology and mouthfeel during consumption. Reformulation to alter an original recipe of food by removal and addition of certain ingredients to improve final characteristics and nutritional profile of the product can be very challenging. The aim of this work was to exchange egg albumin by plant protein to obtain merengue with approximate sensory profile and to assess the changes in the sensory quality ad rheological properties during storage.

The authors applied techniques such as sensory profiling and texture analysis to compare the plant protein merengues with ones produced from egg albumin stored for 50 days in ambient temperature. Research material consisted of six samples – meringues prepared from egg albumin (control sample), potato protein (100%), chickpea protein (100%), mixtures of potato and chickpea protein in the ratio 75:25, 50:50 and 25:75 %/% produced with experimental recipe. The samples were evaluated for appearance (color, gloss, smoothness), odor (sweet, plant, egg-like), texture-mouthfeel (hardness, crunchiness, stickiness, scattering in the mouth), flavor (sweet, bitter, sour, plant) and overall quality by nine trained panelists. Linear 10 centimeter scale was applied. Texture analysis of the meringues was performed using a texture analyzer (Brookfield CT3-1500). Test speed 1.0 mm/s, deformation 5.0 mm/s and trigger force 5.0 g were used to measure peak load, work and adhesive force.

During storage, changes in texture attributes were observed, with the most notable difference for hardness that correlated with load peak measured instrumentally. Meringues made with chickpea protein had the highest initial load peak values, which decreased significantly during storage, reflecting the decline in sensory-perceived hardness. A similar decreasing trend was

observed in samples based on potato protein and the 75:25 %/% potato-to-chickpea ratio. In contrast, an increase in both instrumentally and sensory measured hardness was recorded for the 25:75 %/% sample, resulting in the highest overall sensory quality, comparable to meringues made with egg albumin.

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SENSORY PROFILING OF FUNCTIONAL POWDERS FROM LOCAL INGREDIENTS IN OAT AND SOY BEVERAGES USING ELECTRONIC NOSE AND TONGUE

Joanna Kolniak-Ostek[1], Davide Giacalone[2], Laura Vázquez-Araújo[3], Luis Noguera-Artiaga[4], Jessica Brzezowska[1], Agnieszka Kita[5], Anna Michalska-Ciechanowska[1]

[1] *Department of Fruit, Vegetable and Plant Nutraceutical Technology, Faculty of Biotechnology and Food Science, Wrocław University of Environmental and Life Sciences, Poland*

[2] *Department of Green Technology, University of Southern Denmark, Odense, Denmark*

[3] *Basque Culinary Center, Faculty of Gastronomic Sciences, Mondragon Unibertsitatea, Donostia-San Sebastián, Spain*

[4] *Centro de Investigación e Innovación Agroalimentaria y Agroambiental, Miguel Hernandez University, Orihuela, Spain*

[5] *Department of Food Storage and Technology, Faculty of Biotechnology and Food Science, Wrocław University of Environmental and Life Sciences*

e-mail: joanna.kolniak-ostek@upwr.edu.pl, jessica.brzezowska@upwr.edu.pl, anna.michalska@upwr.edu.pl, dg@igt.sdu.dk, lvazquez@bculinary.com, lnoguera@umh.es, agnieszka.kita@upwr.edu.pl

Keywords: fruit powders, electronic nose, electronic tongue, sensory characteristics

The development of functional powdered compositions from local fruits and herbs offers a promising approach to enhance the nutritional and sensory properties of plant-based beverages, whose flavor profiles are often not fully accepted by consumers. These powders, rich in bioactives, can significantly improve the functional properties of soy- and oat-based drinks, but their incorporation presents formulation challenges, as such additions may alter the taste and aroma of the final product. To address this, objective sensory evaluation is essential in the early development stages. Electronic nose and tongue systems, which are sensor-based technologies that simulate human olfaction and taste, provide fast, repeatable and unbiased analysis, making them useful tools for assessing sensory attributes in such complex food matrices.

The composition of the powders was developed by an international team within the SEASONED project, through the NPD process, focusing on idea generation and concept development. The approach was consumer-driven, emphasizing natural products and the use of local plant sources. Powders were formulated from apple and pear juices combined with rhubarb, Japanese quince, rosehip, and lemon balm, and spray dried with trehalose. These products were incorporated into commercial soy and oat beverages. Aroma was analyzed using the HERACLES electronic

nose (Alpha MOS) with dual-column GC-FID and PCA. Taste was assessed using the electronic tongue with seven potentiometric sensors, supported by AlphaSoft analysis and PCA.

Results from the electronic nose revealed distinct volatile profiles: soy-based beverages exhibited roasted and sweet notes, while oat-based drinks were characterized by fruity and nutty aromas. Volatile compounds such as acetaldehyde and ethyl formate were associated with stronger sensory impressions in selected samples. PCA enabled the identification of six aroma-based sample clusters. The electronic tongue differentiated five taste groups, highlighting variations dependent on the beverage matrix (soy or oat). Water-based formulations displayed simpler sensory patterns, whereas trehalose-containing variants showed a masking effect on bitterness and an enhancement of sweetness. The combination of electronic nose and tongue technologies proved effective in characterizing complex sensory profiles and distinguishing between different powdered formulations added to plant-based beverages. These systems provided useful support in identifying sensory shifts related to ingredient interactions, contributing to the improvement of taste and aroma.

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VISUAL PERCEPTION OF FOOD IN AUTISM SPECTRUM DISORDER: EYE TRACKING RESEARCH

Anna Kot, Eliza Kostyra, Anna Piotrowska

Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland

e-mail: anna_kot1@sggw.edu.pl

Keywords: food perception, eye tracking, autism spectrum disorder, neuroscience

This work aimed to describe a new way of measuring food perception among people with autism spectrum disorder using neuroscience tools such as eye tracking. The research objective was met based on a review of the current scientific literature, focusing on the effectiveness and usefulness of this technique.

Autism spectrum disorders (ASD) are defined as life-long neurodevelopmental disorders characterised by impairments in three domains of function: social behaviour, communication abilities and restricted or repetitive patterns of behaviour. Moreover, autism spectrum disorders also affect other daily issues, including eating. For instance, children with ASD are often described as highly selective eaters, with extremely restricted repertoires of food acceptance, which can be limited to new products. This can make food choices a significant issue among people on the autism spectrum. Additionally, numerous studies suggest that sensory factors such as smell, texture, colour and temperature of food play a crucial role in food perception in autism spectrum disorder.

Based on the literature, eye tracking can be used to measure visual perception among adults and children with autism spectrum disorder. Overall, this technique is well-established, and it is widely and successfully applied by researchers. Eye tracking is useful for detecting and providing crucial information about atypical visual attention. For example, an eye-tracking study focuses on measuring the reaction of children with ASD to presented different photos of food. Such results are often combined with the hedonic responses of participants and neophobia scores. The researchers highlight that giving more time to explore the food and then the possibility of appreciation and acceptance may contribute to managing the sensory experience and establishing food familiarity among children.

Finally, using eye tracking in combination with different sensory methods and neuroscience techniques may be a potential way of understanding atypical food perception among adults and children with autism spectrum disorders.

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THE ROLE OF SENSORY EVALUATION IN DESIGNING INNOVATIVE FOOD PRODUCTS: FROM CONSUMER PREFERENCES TO FUNCTIONAL FORMULATIONS

Katarzyna Leicht, Małgorzata Korzeniowska

Department of Functional Food Products Development, Faculty of Biotechnology and Food Science, Wrocław University of Environmental and Life Sciences, Poland

e-mail: katarzyna.leicht@upwr.edu.pl

Keywords: sensory evaluation, consumer preferences, product formulation

Sensory evaluation is an important tool in the development of innovative food products by linking consumer expectations with product quality attributes. This study demonstrates how different sensory methods can be strategically applied across various product categories to support formulation and positioning decisions.

Three case studies were used to illustrate the diversity of applications: (1) a consumer hedonic evaluation of ten commercially available orange juices, which revealed clear differences in perceived sensory quality correlated with physicochemical properties; (2) a paired comparison test of carrot juice samples with identical content but different branding, highlighting the psychological impact of the label effect on taste perception; and (3) the development and sensory profiling of plant additives-enriched animal-based products, where descriptive and rapid sensory techniques were used to assess acceptance and optimize formulation.

The results confirm that a comprehensive sensory approach – combining analytical and consumer-based methods – not only supports quality assessment, but also provides valuable insights into consumer behavior, product differentiation, and market potential. Sensory analysis thus proves to be an essential instrument in the innovation process within the food industry.

HASKAP BERRY – A SOURCE OF PHENOLIC COMPOUNDS FOR DEVELOPING FUNCTIONAL FOOD WITH ACCEPTABLE SENSORY PROPERTIES

Monika Mieszczakowska-Frąc, Anna Wrzodak, Jan Piecko, Sebastian Siarkowski, Justyna Szwejda-Grzybowska, Dorota Konopacka

Fruit and Vegetables Storage and Processing Department, The National Institute of Horticultural Research, Skierniewice, Poland

e-mail: monika.mieszczakowska@inhort.pl

Keywords: haskap berry, anthocyanins, functional food

Many species of rare fruits, such as the haskap berry can be an interesting raw material for use in processing, which can significantly expand the range of fruit products more attractive. It is a particularly valuable fruit due to its high content of bioactive components such as anthocyanins and catechins. The dominant anthocyanin of the haskap berry is glucoside–cyanidin. It is a compound with a dark color and quite high durability, hence products made from haskap berries are characterized by attractive color.

The aim of the conducted research is to develop ready-made recipes for processed products, taking into account such a technological process that will allow the preservation of the bioactive components of the haskap berry and propose a product with acceptable sensory characteristics. As part of the research, a technology for a thick blueberry-strawberry glaze was developed, which can be used as an addition to ice cream or desserts. The first stage of the formulation was aimed at determining the maximum share of concentrated berry puree. The research, based on sensory evaluation, confirmed that in the case of processing old varieties such as 'Wojtek', the share of haskap berries in the berry-strawberry product should preferably not exceed 60%, because with a higher share of haskap berries, the bitter taste begins to dominate, which reduces the palatability of the product.

The received product due to the concentration of both bioactive ingredients and acids in the final stage, required taste correction by adding a sweetener (sucrose, erythritol, xylitol, maltitol, inulin) in the amount of 5–15 g per 100 g of product. Sensory evaluation of the ranking from the most acceptable to the least acceptable variant showed that the topping blends best in terms of taste when sweetened with erythritol in the amount of 10 g/100 g of product and traditional sucrose (5 g/100 g). The research methodology included checking the effect of the formulation method on the sensory properties of the haskap-strawberry topping. The topping was prepared

by combining concentrated haskap puree (60%) with concentrated strawberry puree (40%), and the topping was produced by concentrating puree made from a mixture of haskap and strawberries (60:40%). Both topping formulations were sweetened with erythritol and sucrose.

Sensory evaluation showed that the proposed recipe for the berry-strawberry glaze is characterized by a very attractive aroma (notes 7.5–7.8 j.u.) and color (notes 8.2–8.5 j.u.). It was noted that the glazes obtained from the mixed puree, both in the case of sweetening with sucrose and erythritol, were characterized by a less noticeable strawberry aroma and a lower perception of strawberry taste than the glazes obtained from the combination of two concentrated purees.

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PERCEPTION OF A NEW POTATO SNACKS WITH ADDITION OF DIFFERENT LEVEL OF BEE POLLEN

Agnieszka Nemś[1], Luis Noguera-Artiaga[2], Hanán Issa-Issa[2], Angel Carbonell-Barrachina[2], Alan Gasiński[3], Agnieszka Kita[1]

[1] *Department of Food Storage and Technology, Faculty of Biotechnology and Food Sciences, Wrocław University of Environmental and Life Sciences, Poland*

[2] *Centro de Investigación e Innovación Agroalimentaria y Agroambiental, Miguel Hernández University, Orihuela, Spain*

[3] *Department of Fermentation and Cereals Technology, Faculty of Biotechnology and Food Sciences, Wrocław University of Environmental and Life Sciences, Poland*

e-mail: agnieszka.nems@upwr.edu.pl

Keywords: bee pollen, snacks, cross-cultural studies, consumer studies

Bee pollen is flower pollen collected from plant anthers and properly processed by honey bees (mix with secretion from salivary glands or nectar and place it in specific baskets on their hind legs. In this study, consumer research on a new product was combined in case of snacks with the addition of bee pollen - a raw material rich in bioactive compounds, primarily polyphenols.

The aim of the research was to determine the perception of a new potato snacks with addition of different levels of bee pollen by different consumer groups from countries that represented Mediterranean (Spain), and Central European (Poland) food cultures. Consumer studies were carried out in both Poland and Spain, involving three types of snacks: one containing 10% bee pollen, one with 5%, and a control sample without bee pollen. The number of participants in Poland was 103, while in Spain it was 93. In consumer test questionnaire were used questions on: liking, CATA questions, demographic questions, sustainability habits questionnaire. Questionnaire was conducted by RedJade.

Consumer research conducted in Poland and Spain shows that Spaniards prefer snacks with 5% added bee pollen, while among Polish consumers, snacks with pollen, regardless of the size of the addition, were assessed similarly to the snacks from the control sample. Both Spaniards and Poles rated snacks with 5% added bee pollen the best in terms of taste. Analyzing the data from the responses to CATA questions, consumers stated that in snacks with added bee pollen, flavor notes such as honey, chamomile, floral, roasted, earthy, cereal, medicinal, pungent, spicy, caramel were more noticeable, and potato flavor was less noticeable.

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THE USE OF CINNAMON IN THE PRODUCTION OF LOW-ALCOHOLIC BEER – SENSORY AND TECHNOLOGICAL ASPECTS OF AN INNOVATIVE PRODUCT

Aneta Pater, Paweł Satora, Magdalena Januszek

Department of Fermentation Technology and Microbiology, University of Agriculture in Kraków, Poland

e-mail: aneta.pater@urk.edu.pl

Keywords: low-alcoholic beer, cinnamon addition, sensory analysis

The growing interest in innovative, low-alcoholic beverages has increased attention on low-alcoholic beer (LAB, <1.2% v/v). Due to limited ethanol and volatile compound formation, enhancing the sensory quality of LAB remains challenging. The use of spices such as cinnamon (*Cinnamomum verum*) offers promising aromatic and functional benefits.

This study aimed to assess the sensory and technological impact of cinnamon addition at different production stages of LAB brewed with a modified high-temperature mash (76°C, 40 min) to reduce fermentable sugars. Fermentation with bottom-fermenting lager yeast (*Saccharomyces pastorianus)* lasted 14 days. Cinnamon was added during wort boiling, before fermentation, and post-fermentation (day 7). A control sample was included.

Analyses included alcohol by volume (ABV), pH, apparent extract, and free amino nitrogen (FAN). Sensory evaluation (QDA) was conducted by a trained panel. Volatile compounds were examined using gas chromatography–mass spectrometry (GC-MS) and gas chromatography–olfactometry (GC-O).

Cinnamon addition significantly influenced aroma and flavor. The post-fermentation variant yielded the most intense spicy notes, while boiling-stage addition led to a milder, integrated profile. GC-MS and GC-O confirmed cinnamon-derived volatiles, with their concentration varying by timing. All cinnamon samples had enhanced aromatic complexity and greater panel acceptability. Alcohol content in all variants remained below 1.2% v/v.

In conclusion, cinnamon is an effective additive for improving LAB flavor. Combined with a modified mashing process, it supports the creation of novel, sensory-rich low-alcoholic beer styles.

PACKAGING SENSORY EVALUATION CAPABILITY BUILDING: FUELING THE MOMENTUM OF SUSTAINABLE PACKAGING & GLOBAL GROWTH OF SNACK PRODUCTS

Michelle Leslie Quiambao-Pablo[1], Alvaro Henrique Carvalho[2], Afsha Chugtai[4], Elena Kotsaki[1], Valerie Rabaino-Lieberman[3], Simon O'Neill[3], Angela Robinson[4], Tarin Songsakphisarn[3]

[1] *Mondelēz International RD&Q Sp. z.o.o, Global R&D Consumer Science, Wroclaw, Poland*

[2] *Mondelēz Brasil Ltda., Global R&D Consumer Science, Curitiba, Brazil*

[3] *Mondelēz International RD&Q s.p. z.o.o, Global R&D Consumer Science, New Jersey, USA*

[4] *Mondelēz UK R&D Limited, Global R&D Consumer Science, Birmingham, UK*

e-mail: leslie.pablo@mdlz.com, elena.kotsaki@mdlz.com, alvaro.carvalho@mdlz.com, valerie.rabaino@mdlz.com, simone.oneill@mdlz.com, tarin.songsakphisarn@mdlz.com, angela.robinson@mdlz.com, afsha.chugtai@mdlz.com

Keywords: sensory packaging training, plastics and flexible films packaging lexicon, visual, auditory and tactile packaging attributes, sustainability for snacks packaging

Consumer perception has immensely shifted towards packaging – now with equal focus as the food product it contains, due to increased sentiment toward a more sustainable lifestyle paired with the call to action in mitigating our planetary crisis. Playing a crucial role as a necessary mediator in the food system, studies on packaging have been limited in relation to the wide range of product categories available and constraints on identifying a proposed set in a rapidly changing global setting.

Mondelēz International aims to fuel development of sustainable flexible films and plastics predominant to snacking products through sharing a cross-culturally developed Packaging Sensory Lexicon as characterized through a descriptive analysis with our trained panelists that captures visual, olfactory, auditory and tactile descriptors of snacks packaging, as well as impart relevant learnings on dominant sensory modalities during consumer package touch points from purchase to disposal. Through Knowledge Mapping and Quantitative Descriptive Analysis methodologies, this poster showcases our built sensory packaging language, its value-added properties and applications on snacks product development. Practical work entailed building the capability on visual, auditory and tactile sensory evaluation of trained panelists for snacks packaging across global R&D technical centers.

Our developed Sensory Packaging wheel and lexicon to be a comprehensive and reliable communication as well as training tool, not only for R&D but also for Marketing, QA and External

business partners for effective packaging design – encompassing both *imitation approach* or *differentiation strategy* for disruptive innovative eco-designs. By summarizing the different sensory properties corresponding to the 4 key stages of packaging-consumer interaction: (1) Purchase, (2) Transport & Storage, (3) Consumption, and (4) Disposal, this study suggests how packaging designers can go beyond visual explicit claims or logos, and optimize sustainability communication by combining it with implicit sensory packaging cues – especially tactile, that can increase the salience, perception and disposal behavior supporting our global sustainability goals.

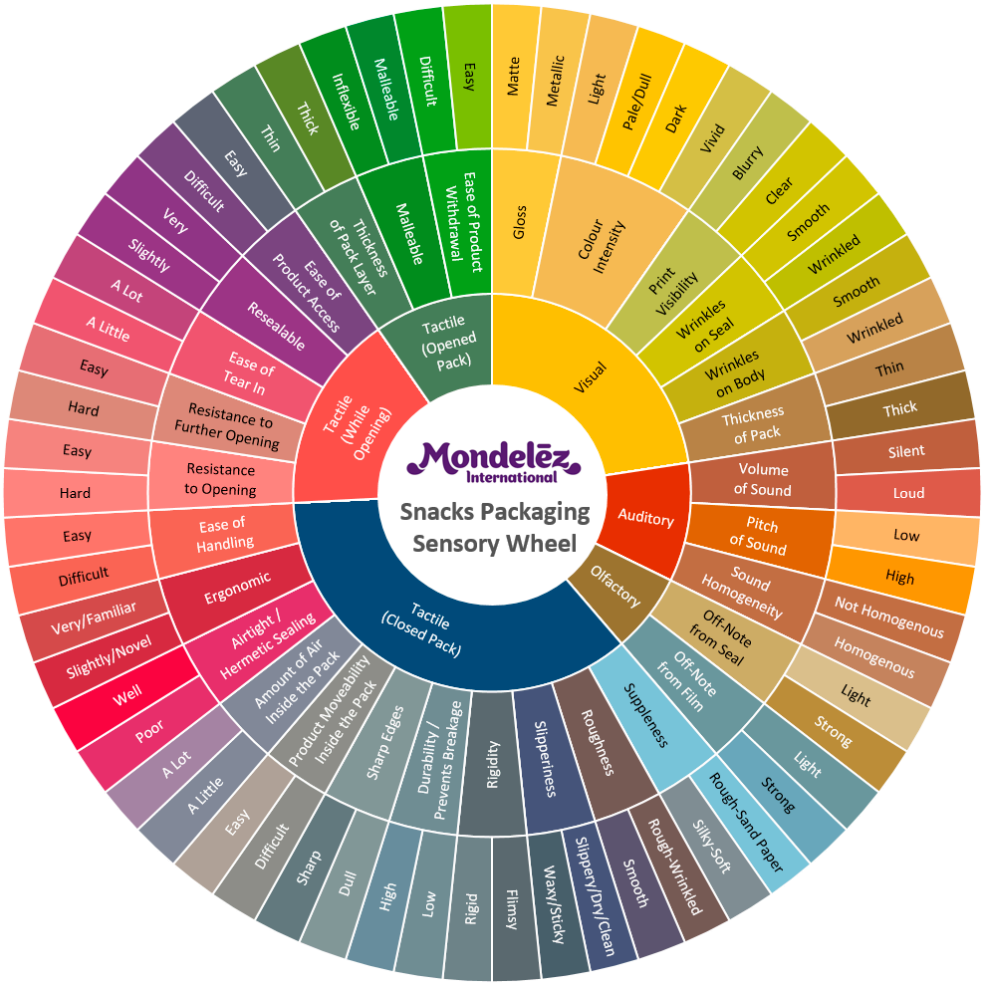

Fig. 1. Developed Snacks Packaging Sensory Wheel standardizing sensory vocabulary to aid packaging development initiatives towards MDLZ V2030 Sustainability Goals

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SENSORY PROFILE OF HOMEMADE FERMENTED PROTEIN BEVERAGES FOR ELDERLY NUTRITION SUPPORT

Marta Rodríguez[1], Ana B. Ropero[2], Marta Beltrá[2], Ángel A. Carbonell-Barrachina[1], Marina Cano-Lamadrid[1], Esther Sendra-Nadal [1]

[1] *Centro de Investigación e Innovación Agroalimentaria y Agroambiental, Universidad Miguel Hernández de Elche, Orihuela, Alicante, Spain*

[2] *Institute of Bioengineering, Miguel Hernández University de Elche, Orihuela, Alicante, Spain*

e-mail: marta.rodriguez11@goumh.umh.es

Keywords: whey protein, fermented milk, seniors

Aging is characterized by multiple physiological changes that modify protein utilization and requirements. This is likely due to reduced food intake (sensory decline) and the presence of chronic diseases. Increasing protein intake is recommended to maintain or improve nutritional status, support muscle protein synthesis, and/or preserve lean body mass in the elderly. Most guidelines recommend a protein intake of 1.0–1.2 g/kg of body weight a day (g/kg/day BW) for the elderly, and even 1.5–2.0 g/kg/day BW for acute or chronic illnesses, injury or malnutrition. A wide variety of commercially available protein-enriched dairy beverages (with 10–20 g of protein per 100 mL) are currently marketed for specific consumer groups, including the elderly (both healthy and with medical conditions) and sportsmen. At the same time, there is a growing trend of preparing protein-based dairy drinks at home, mixing fermented milk or whipped cheese with protein concentrates, possibly driven by high retail prices and undesirable sensory characteristics of the commercial high-protein products. This trend presents an opportunity to enhance their functionality and nutritional quality while also achieving the desired sensory characteristics at a lower cost. This study aimed to formulate high-protein fermented dairy beverages suitable for home preparation, ensuring a final protein content of 15 g/100 g of product with particular attention to the sensory profiles.

A total of 5 formulations were prepared using fermented milks (yoghurt, bifidus yoghurt, and kefir) or whipped cheeses (fresh whipped cheese and Quark), combined with whole milk and enriched with unflavored whey protein concentrate to reach the target protein level of 15 g/100 mL. The beverages were prepared and stored under various conditions (8h and 24h at 20°C, and 24h at 4°C) to simulate typical home practices and to assess potential changes in nutritional and functional properties. Parameters evaluated after preparation and throughout the expected home storage were: microbial counts (*Lactobacillus*, *Lactococcus*, total viable counts, molds and yeasts), physicochemical (pH, color, and viscosity), and functional com-

pounds (free amino acids, organic acids, and sugars). However, the present study is focused exclusively on presenting the sensory profile of the proposed high-protein fermented dairy beverages. It is worth highlighting that the type of dairy base significantly influenced the sensory profile of high-protein beverages formulated for elderly. All formulations showed good visual and taste homogeneity, with notable sensory differences based on the base: whipped cheeses were the most viscous, creamy and sour; yoghurts varied in sweetness and cooked aroma /flavor; and kefir was the least viscous and sour. It is important to emphasize that beyond sensory aspects, microbial counts and key nutritional compounds (organic acids, sugars, and free amino acids) must also be considered, as they play a crucial role in shaping the overall quality of high-protein beverages. This underscores the need for correlation analysis and monitoring of changes during storage.

EFFECT OF SWEETENER ON THE LIQUEUR QUALITY

Agnieszka Ryznar-Luty[1], Krzysztof Lutosławski[2]

[1] *Department of Bioprocess Engineering, Wrocław University of Economics and Business, Poland*

[2] *Department of Process Management, Wrocław University of Economics and Business, Poland*

e-mail: agnieszka.ryznar-luty@ue.wroc.pl, krzysztof.lutoslawski@ue.wroc.pl

Keywords: liqueur, sweetener, *Vaccinium myrtillus* L., *Vaccinium corymbosum* L.

Fruit alcoholic beverages, such as tinctures and liqueurs, are becoming increasingly popular among people searching for traditional products offering exceptional organoleptic qualities and health-promoting properties. Treating fruits with alcohol results in releasing and extracting active components from the raw material. These include, among others, phenolic compounds exhibiting antioxidative activity, which mitigates the pro-oxidative effect of alcohol. Dark blue or red berries are most often used to produce liqueurs due to their high antioxidative capacity. Sugars are essential ingredients of liqueurs and can be obtained from many sources depending on the price, availability, legality and required properties of the finished product. Apart from sugar cane or sugar beet sucrose, other sweet substances can be used to this end, including e.g., glucose or high-fructose syrups, honey, rectified concentrated must or other natural carbohydrate substances ensuring effects equivalent to the above-mentioned products.

This study aimed to investigate the effect of the type of sweetener (xylitol, stevia and cane sugar) used on the quality of liqueurs from *Vaccinium myrtillus* L. and *Vaccinium corymbosum* L. Selected organoleptic characteristics and physicochemical parameters were evaluated.

The liqueurs were determined for the following physicochemical parameters: pH, total acidity, density, total soluble solids, color, ethanol content, polyphenol content, and redox potential using DPPH, ABTS, and FRAP assays. The liqueurs were subjected to sensory assessment through the Qualitative Descriptive Analysis (QDA), which consists in the quantitative evaluation of individual quality attributes, i.e.: color, texture, aroma, perception of alcohol content, and palatability understood as the general flavor, aroma and sensory sensations, which were components of the overall quality of the analyzed products.

The analyzed liqueurs showed comparable overall sensory quality. The evaluation panel accepted all three variants. However, the panelists preferred the liqueur with higher density and lower acidity. Although the results of the CIE L*a*b* measurements indicated that the average observer should not notice any difference in the color of the liqueurs, the liqueur sweetened with xylitol received a significantly lower score in the sensory assessment compared to the liqueurs sweetened with stevia and cane sugar.

IMPACT OF CATION EXCHANGE RESINS ON THE SENSORY AND AROMATIC PROFILE OF MONASTRELL RED WINES

Paola Sánchez-Bravo[1], Ana Leticia Pérez-Mendoza[1], Alejandro Martínez-Moreno[1], Encarna Gómez-Plaza[1], Ricardo Jurado-Fuentes[2], Ana Belén Bautista-Ortín[1]

[1] *Department of Food Science and Technology University of Murcia, Faculty of Veterinary Sciences, C. Campus Universitario, Murcia, Spain*

[2] *Agrovin S.A., Alcázar de San Juan, Ciudad Real, Spain*

e-mail: paola.sanchez2@um.es

Keywords: acidity, cation exchange resins, tartaric acid, volatile compounds, descriptive analysis

Climate change significantly affects vine physiology and grape composition, leading to reduced acidity, increased ethanol content, and higher pH levels in wines. These changes are particularly problematic in arid and semi-arid regions, such as the Mediterranean, where high summer temperatures and low rainfall accelerate the degradation of grape acids. Consequently, wines often lack freshness and balance, descriptors associated with high-quality products. As a solution for this problem, the winemaker may use various techniques during the elaboration wine process, such as acid addition, ion exchange, blending with high-acidity wines, and biological methods. Among these, cation exchange resins is one of the most widely techniques used for its effectiveness and low cost. For that, the objective of this study was to determine the effect of must acidification using cation exchange resins on the aromatic and sensorial profile of Monastrell red wines, comparing them with wines adjusted to the same pH with tartaric acid and untreated control wines. The results showed that treatments were effective in reducing pH of wines. Furthermore, the use of cation exchange resins affected the composition of the wines' aromatic profile, with a significant increase in the concentration of esters and terpenes and, also improved their sensorial profile, since for these wines the highest intensities of flavor and aroma sensory descriptors were obtained. Those global descriptors are related to the highest freshness, fruity and floral intensity descriptors, as well as lower intensity of astringency. Therefore, the application of cation exchange resins in must may be an effective strategy to increase the acidity of Monastrell red wines, while also improving their volatile composition and overall quality.

SENSORY LIVING LAB AS SUPPORT FOR THE PROCESSING OF POLISH BERRY FRUITS

Sebastian Siarkowski[1], Dorota Konopacka[1], Monika Mieszczakowska-Frąc[1], Alexia Jauniau[2], Agnès Giboreau[2], Dawid Wieloch[1]

[1] *Fruit and Vegetables Storage and Processing Department, The National Institute of Horticultural Research, Skierniewice, Poland*

[2] *Institute Lyfe, Sensory and Consumer Research Centre, Lyon, France*

e-mail: monika.mieszczakowska@inhort.pl

Keywords: berry fruits, chokeberry, haskap berry, food processing, Living Lab

Polish berries such as chokeberry and haskap berry have high nutritional value and proven health benefits, thanks to the high content of phenolic compounds. Despite their excellent health-promoting properties, they are still underestimated by consumers, and food producers are afraid of processing them.

Producers of these fruits and processors point to important issues affecting the market and technological barriers: (1) very low consumer awareness of chokeberry and haskap berry, (2) difficulties related to their intense and specific taste, and (3) the lack of well-established buying habits.

In order to give berries a chance for wider acceptance among modern consumers, the Institute of Horticulture is implementing the 'HortiFoodTrends' project, the aim of which is, among others, to propose berry products with attractive sensory values. The project uses a Living Lab approach – a model of cooperation between producers, processors, scientists, and consumers. This helps to design products together based on real market needs. As part of this approach, qualitative research was carried out in Lyon (France) with consumers, in collaboration with the Institut Lyfe team. These studies helped to better understand how people talk about berry fruits, what sensory and functional features they care about, and what product formats could make them more likely to buy and consume them. These findings now serve as the basis for the next project steps – from designing new product ideas to preparing prototypes that match both production possibilities and consumer expectations. Bringing together all stakeholders from the agri-food sector and the consumer is a way to create products with high market potential, both locally and across Europe.

HOW IS BABY FOOD DESIGNED? EXPLORING SENSORY TECHNIQUES

Ana M. Solivella-Poveda, Marina Cano-Lamadrid, Ángel A. Carbonell-Barrachina, Esther Sendra-Nadal

Instituto de Investigación e Innovación Agroalimentario y Agroambiental, Universidad Miguel Hernández de Elche, Orihuela, Alicante, Spain

e-mail: asolivella@umh.es

Keywords: sensory techniques, baby food, infants, toddlers, product development

Introduction: Given the importance of addressing the growth and maturation needs of infants and toddlers, research on baby food development has primarily focused on the nutritional composition and quality of such products. However, sensory attributes also play a crucial role in shaping product preference among this population and influencing the purchasing decisions of parents and caregivers. Consequently, sensory analysis emerges as a key tool in guiding the development of products with optimal and enhanced sensory profiles.

Objective: To provide a comprehensive overview of how sensory analysis can be used as a tool to develop and optimize foods for infants and toddlers. Scope of research: This scoping review explores, analyzes and synthesizes various sensory techniques applied to the development of food products tailored to the needs and preferences of infants and toddlers.

Material and methodology: This study followed the methodology of a scoping review, conducted in accordance with the PRISMA Extension for Scoping Reviews (PRISMA-ScR). The PRISMA 2020 guidelines and checklist were adhered to throughout the process. An extensive literature search was carried out in the Web of Science database in April 2025 using the following keyword combinations: *sensory* + *techniques* + *baby/toddlers/infant* + *food*, across all searchable fields and covering the period from 2020 to 2025. A total of thirty-three studies that met the eligibility criteria were selected.

Results and conclusions: The study of baby foods within the field of sensory analysis focuses on not only infant formulas, but also purees and compotes, cereals, fermented beverages, and snacks such as biscuits or dried fruits. It aims to understand the impact of ingredients, processing methods, and degradation reactions during storage on compounds that influence sensory properties and consumer acceptability. Due to the cognitive and methodological limitations and ethical-legal considerations involved in using infants or toddlers (up to three years old) as panelists for sensory evaluation, their participation has been recorded in only about 15% of the selected investigations, mostly combined with the evaluation of parents or caregivers. These studies were generally approved by an ethics committee or, at minimum, conducted

with informed parental consent. Hedonic tests were the most frequently employed (in about 60% of selected investigations), followed by descriptive analysis. In contrast, techniques such as projective mapping, triangle testing, or dilution analysis were seldom used. Furthermore, to explore the molecular basis of changes in sensory attributes and to obtain a higher degree of accuracy in the detection, characterization and quantification of compounds, these tests were frequently combined with instrumental techniques such as gas chromatography coupled to mass spectrometry (GC-MS) or GC-olfactometry (GC-O) and even with smart sensory technology such as electronic nose or tongue. The sensory results of the texture profile and color were also instrumentally contrasted. Given the ethical constraints and complexity linked to the participation of infants or toddlers in sensory studies it would be necessary to develop suitable standardized procedures to be applied during the development of baby foods.

OLFACTORY PERFORMANCE AND ODOR LIKING ARE NEGATIVELY ASSOCIATED WITH FOOD NEOPHOBIA IN CHILDREN AGED BETWEEN 3 AND 9 YEARS

Agnieszka Sorokowska[1], Dominika Chabin[1], Aleksandra Kamieńska[1], Sabina Barszcz[1], Katarzyna Byczyńska[1], Klaudia Fuławka[1], Arkadiusz Urbanek[2], Anna Oleszkiewicz[1,3]

[1] *Institute of Psychology, University of Wrocław, Poland*

[2] *Institute of Pedagogy, University of Wroclaw, Poland*

[3] *Taste and Smell Centre, Technische Universität Dresden, Germany*

e-mail: agnieszka.sorokowska@uwr.edu.pl

Keywords: food neophobia, child nutrition, feeding problems, sensory sensitivity, olfaction

Introduction: Child food neophobia – the reluctance or refusal to try unfamiliar foods – is a widespread nutritional concern that negatively influences diet quality and hinders the development of healthy eating habits. While sensory sensitivity is known to impact levels of food neophobia, prior research has seldom addressed the specific role of olfactory factors in children.

Objective: This study aimed to explore in depth the association between different facets of olfactory sensitivity and food neophobia in children.

Material and Methodology: A total of 246 children, aged three to nine years, participated in assessments measuring food neophobia and underwent detailed psychophysical testing of their olfactory abilities.

Results: Findings indicated that certain aspects of smell perception – such as reduced odor liking, weaker odor identification skills, and lower sensitivity to an unfamiliar non-food odor – were significant predictors of increased food neophobia in children. Among the personal characteristics examined, only the child's age showed a significant, positive correlation with food neophobia. An exploratory analysis of family environment variables revealed that higher food neophobia was associated with less autonomy granted to the child during feeding and a more frequent use of food as a reward.

Conclusions: The results suggest that diminished olfactory function may contribute uniquely to nutritional challenges in children. These findings encourage further exploration of olfaction-based interventions as a potential strategy for reducing food neophobia in early childhood.

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THE MULBERRY JUICE FERMENTED BY *LACTIPLANTIBACILLUS PLANTARUM* O21: THE FUNCTIONAL INGREDIENT IN THE FORMULATIONS OF FRUITY JELLIES BASED ON DIFFERENT GELLING AGENTS

Aleksandra Szydłowska[1], Dorota Zielińska[1], Barbara Sionek[1], Danuta Kołożyn-Krajewska[2]

[1] *Department of Food Gastronomy and Food Hygiene, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland*

[2] *Department of Dietetics and Food Studies, Faculty of Science and Technology, Jan Dlugosz University in Czestochowa, Poland*

e-mail: aleksandra_szydlowska@sggw.edu.pl, dorota_zielinska@sggw.edu.pl, barbara_sionek@sggw.edu.pl, d.kolozyn-krajewska@ujd.edu.pl

Keywords: mulberry juice, probiotics, gelatin, agar–agar, sensory properties

Introduction: Fruits of the black mulberry (*Morus nigra* L.) have a distinct flavor with juicy and acidic qualities and high staining activity, and are therefore attractive for usage in the food processing industry. Many scientific studies also point to the fact that it can be also a healthy food matrix for probiotic delivery.

Objective: This study aimed to investigate the effects of adding probiotics, prebiotics, and different types of jelly agents on a few key quality attributes of potentially functional mulberry jellies throughout a 10-day storage period at 4°C.

Scope of research: (1) production of functional jellies based on fermented black mulberry juice, in laboratory conditions; (2) assessment of the pH value and count of LAB bacteria in fresh and stored products; (3) assessment of antioxidant activity, anthocyanin content and color of unfermented black mulberry juice, fresh stored and products; (4) assessment of the sensory quality of developed desserts, and (5) statistical analysis of the results obtained.

Materials: bacterial strain with probiotic properties – L. *plantarum* O21 (GenBank accession KM 18615), mulberry pasteurized juice (Eka Medica Co., Kozy, Poland), inulin (Frutafit® Tex, Roosendaal, The Netherlands), agar–agar (Agnex, Białystok, Poland), sucrose (Diamant, Gostyń, Poland), and distilled water.

Methodology: (1) *microbial analysis* – the count of LAB (TEMPO ® System, BioMérieux, Mercy Etoile, France), (2) *Acidity Analysis* (Potentiometry method), (3) *Total Anthocyanin Concentration* (Spectrophotometric method), (4) *Determination of Antioxidant Activity* (DPPH

Radical Scavenging Assay, ABTS Radical Scavenging Assay), (5) *Color Measurement* (CIELab system), (6) *Sensory Analysis* (Quantitative Descriptive Analysis).

Results: Lactic acid fermentation positively affected the total anthocyanin concentration of investigated products. Also, antioxidant capacities of mulberry juices were improved by L. *plantarum* O21 fermentation. The results showed that the applied prebiotic–inulin addition and agar–agar addition, as a gelling agent in recipes of potentially functional mulberry jellies, were proved to be beneficial technological solutions, both in fresh and stored products, and obtained an appropriate, high number of LAB bacteria, good sensory quality, and beneficial antioxidant properties.

Conclusions: This study demonstrated the use of a half-product in the form of mulberry juice fermented with the *L. plantarum* O21 strain with probiotic properties, including such additives as: the gelling agent (gelatin; agar–agar), prebiotic (inulin), impact on the color parameters, TAC content, antioxidant activities, and sensory quality of final products, such as functional jellies.

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THE SENSORY FOOD ANALYSIS LABORATORY 'SEASONED'

The Sensory Food Analysis Laboratory 'Seasoned' at the Wrocław University of Environmental and Life Sciences is a modern research facility dedicated to the analysis of sensory quality in food and consumer products. Equipped with individual tasting booths, controlled lighting, and environmental conditions, the lab meets international standards for sensory evaluation.

The lab supports a wide range of research activities – from academic studies on perception and preference to applied projects in product development and quality control. It serves as a key hub for the SEASONED project and other initiatives focused on the intersection of sensory science, nutrition, and consumer behavior.

By combining rigorous methodology with practical applications, the Sensory Laboratory plays a central role in advancing both education and innovation in the field.

Contact: sensorylab@upwr.edu.pl