Poster Session

PART 1 Food Preservation, Packaging, and Distribution

P1-01

Effects of rice flour-based and nano-foam-structured films on the quality of cut Korean cabbage *kimchi* during storage at ambient temperature

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This study aimed to evaluate the effects of airtight multilayer (AM), rice flour–based (RFB), and nano–foam–structured (NFS) films on the headspace gas composition, packaging volume expansion ratio, and quality of cut Korean cabbage *kimchi* (KCK) stored at 20℃ for 4 days. The headspace CO_2 concentrations for the RFB treatment showed slight changes over the range of 2.8 – 13.4% during the storage period. In contrast, the headspace CO_2 concentrations of the AM and NFS treatments increased steadily, reaching 79.4% and 44.6% after 4 days of storage, respectively. After 4 days of storage, the packaging volume expansion ratio of the RFB treatment was 1.86, which was lower than the 4.79 and 2.87 observed in the AM and NFS treatments, respectively. No significant differences were observed in the microbial counts among the AM, RFB, and NFS treatment groups. In addition, different packaging types did not significantly affect the physicochemical quality of cut KCK. Package distension was observed in the AM treatment, whereas no distension was observed in the RFB or NFS treatment groups. These results suggest that RFB and NFS films can prevent package distension caused by CO_2 accumulation without affecting the quality of cut KCK during storage.

P1-02

Shelf-life extension of *kimchi* using a smart reefer container with temperature control and fermentation monitoring

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Temperature control is a critical technology for reducing food loss and waste, and uniform thermal management must be maintained continuously throughout the cold chain from production to consumption. In particular, failures in temperature control can rapidly accelerate the fermentation of fermented foods such as *kimchi*, resulting in quality deterioration and shortened shelf-life. Therefore, improving the storage stability of fermented foods requires not only precise temperature control but also real-time monitoring and active regulation based on fermentation status. Accordingly, the objective of this study was to develop and evaluate a smart reefer container (SRC) to extend the shelf life of kimchi. The developed SRC system was equipped with an air circulation-enhancing structure, distributed temperature sensors, a wireless temperature-control PLC, and a real-time fermentation monitoring system for pH and CO_2. The air circulation structure reduced temperature deviations inside the container to within approximately 1°C, while the wireless monitoring and remote control system maintained the pH below 5.6 and CO_2 concentration below 2.0% for up to 120 days. These results demonstrate the potential of the SRC system as a practical and scalable cold-chain technology for improving kimchi storage stability during distribution.

P1-03

Effects of duplex wave-assisted washing on the quality characteristics of strawberries during storage

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This study evaluated the applicability of duplex wave-assisted washing, which combines low- and high-frequency vibrations, as a postharvest treatment for improving the storability of strawberries. 'Geumsil' strawberries were treated with duplex wave-assisted washing for 16 min and stored at room temperature for 7 days. Quality parameters, including pH, soluble solids content (SSC), titratable acidity (TA), sugar-acid ratio (SSC/TA), color difference (ΔE), hardness, and weight loss, were analyzed. No significant differences were observed in pH, SSC, SSC/TA, ΔE throughout the storage period, indicating that the duplex wave treatment had limited effects on chemical quality attributes of strawberries. Hardness did not differ significantly between the groups during the early storage period (days 1–3); however, treated fruits exhibited relatively higher values during the later storage period (days 6–7). In contrast, weight loss in the treated group reached 15.91%, approximately 3.3-fold higher than that in the control group (4.85%), indicating that the treatment markedly accelerated moisture loss. In addition, visual observations revealed greater variability in fruit quality, uneven surface texture, and localized softening in the treated group. These results indicate that duplex wave-assisted washing did not improve the storability of strawberries under room-temperature storage conditions and may accelerate moisture loss and quality deterioration. Further studies are needed to optimize treatment conditions and evaluate its effectiveness under refrigerated storage and modified atmosphere packaging (MAP).

P1-04

Changes in the postharvest quality characteristics of *Codonopsis lanceolata* depending on temperatrue

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Deodeok(*Codonopsis lanceolata*) which has high pharmacological effects, contains medicinal ingredients such as lobetyolin and tangshenoside Temperature of storage can vary depending on the characteristics of the crops and affects postharvest quality characteristics and storage period. In addition, storage temperature can affect not only storage quality but also distribution quality. So it is important to determine the appropriate storage temperature. Therefore, this study analyzed storage quality and distribution quality in relation to storage temperatures. 3-year-old deodeok harvested in Hoengseong was stored. The deodeok was stored at −4, −2, 0, and 4°C. It was stored at each temperature for 5 months. Each month, a fixed quantity was used for simulated distribution conditions at room temperature and low temperature as 4°C for 15 and 30 days. Quality characteristics such as weight loss rate, marketable root rate, and decay rate were measured. The results showed that the weight loss rate was highest at −2°C and lowest at 4°C during the storage period. Deodeok stored at −4°C showed relatively low weight loss during storage and maintained high marketability based on appearance, indicating no quality deterioration. However, the entire batch rotted during distribution just one month after storage. Therefore, the postharvest quality of deodeok is affected by storage temperature. It is important to set optimal storage temperature conditions for deodeok.

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P1-05

유통기한 임박 김치를 활용한 상온유통형 김치 스프레드 개발

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김치는 대표적인 한국 발효식품으로, K-food 확산과 함께 해외 시장에서의 소비가 증가하고 있다. 그러나 김치 원물은 냉장 유통이 필수적이며 발효 및 젓갈 유래 풍미로 인해 해외 소비자의 일상적·지속적 소비에 한계가 있다. 이에 본 연구에서는 해외 소비자를 타겟으로 김치 고유의 발효 풍미는 유지하면서도 보다 친숙한 소비 형태를 제공하기 위해 조리 없이 빵에 발라 먹는 스프레드 제품을 개발하였으며, 유통기한이 제한적인 김치의 활용도 증진과 부가가치 창출에 목적을 두었다. 제품은 지역 김치 업체로부터 제공받은 김치를 활용하여 제조하였으며, 젖산, 크림치즈 파우더, 초산 및 구연산을 조합하여 감칠맛은 유지하면서 비린 향미를 완화하고자 하였다. 또한 상온 유통을 고려하여 먼저 분쇄, 농축 공정을 통해 적절한 점도와 발림성을 부여하였고, 미생물 안전성 확보를 위해 멸균 공정을 수행하였다. 감각평가와 기호도 평가 결과 초산 처리군이 풍미 균형, 발림성 및 전체 기호도에서 가장 높은 평가를 받아 최종 시료로 선정되었다. 저장시험 결과 품질이 안정적으로 유지되었으며, 유산균 수 변화를 통해 저장 중 추가 발효가 효과적으로 억제됨을 확인하였다. 본 연구는 김치의 활용성과 해외 시장에서의 소비 접근성 확대 가능성을 제시한다.

P1-06

Optimization of protein extraction conditions for four edible insect species using enzymatic and ultrasonic treatments

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Edible insects are sustainable protein sources, but species-specific extraction optimization remains limited. This study optimized extraction conditions for four Korean edible insects: *Protaetia brevitarsis* larvae (PB), *Tenebrio molitor* larvae (TM), infected *Bombyx mori* (IBM), and *Bombyx mori* (BM). Defatted powders mixed with DW (1:50 w/v) were extracted under nine conditions: room temperature (dw), hot water (hw), ultrasonication (u2h), enzymatic hydrolysis (Protamex [pro], Flavourzyme [fla], Alcalase [alc]), and ultrasonic-assisted enzymes (upro, ufla, ualc). Yield, protein content, and ABTS scavenging activity were evaluated. The method significantly affected all parameters. PB showed superior protein and antioxidant activity under hot water and ultrasonication. TM had the highest yield with fla, but upro enhanced protein recovery and antioxidant activity. For IBM, ufla and ualc yielded the best results. Conversely, BM showed the highest protein and antioxidant activity under room temperature and ultrasonication, proving physical processing more effective than enzymes. Thus, extraction strategies must be species-specific to maximize protein recovery and bioactivity. These findings provide baseline data for functional ingredient development and industrial use of edible insects.

P1-07

Effect of simulated farm-to-retail distribution conditions on the quality of washed eggs

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This study evaluated the quality of washed eggs under simulated farm–to–retail distribution conditions. Four scenarios (T1 – T4) were established by combining temperature exposures during farm storage, raw egg transportation, collection center storage, processing and product storage, product transportation, and retail storage. T1 represented stable low–temperature management, T2 included high–temperature exposure during farm storage, T3 included high–temperature exposure during transportation, and T4 represented prolonged high–temperature retail storage. Egg quality was assessed based on albumen pH, specific gravity, yolk index, egg weight loss, and other related parameters. During distribution, egg weight loss increased with storage duration and temperature exposure, especially under prolonged high–temperature retail storage. Yolk index and specific gravity decreased under unfavorable conditions, indicating reduced freshness. Furthermore, albumen pH increased under high–temperature exposure. These results indicate that continuous temperature control from farm to retail is essential for maintaining washed egg quality.

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P1-08

딸기 화방별 품질 특성 분석 및 저장성 관련 품질 마커 발굴

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딸기는 동일한 품종 내에서도 화방에 따라 과실의 크기, 당도, 산도 뿐만 아니라 유기산, 아미노산, proanthocyanin류 등의 조성 및 함량이 달라진다고 알려져 있다. 하지만, 딸기의 화방별 품질 특성 및 저장성의 관계에 대한 연구는 제한적인 실적이다. 따라서, 본 연구에서는 국내에서 재배되는 딸기 3품종('설향', '비타베리', '킹스베리')을 대상으로 하여 1화방 및 4화방을 대상으로 하여 저장 기간에 따른 품질특성 및 대사체 분석을 실시하였다. 딸기 3 품종의 4화방 과실은 1화방에 비해 과중이 낮고 당도가 높은 경향을 나타냈다. 또한 저장기간이 증가함에 따라 과중과 경도는 감소하였으며, 당도와 당산비는 증가하는 경향을 보였다. 특히 1화방은 저장 중 품질 변화가 상대적으로 완만한 반면, 4화방은 저장 초기에 높은 당도와 당산비를 나타내었으나 저장 중 품질 변화 폭이 크게 나타났다. 저장 기간이 지남에 따라 딸기 3품종의 citric acid, malic acid, aspartic acid 및 tryptophan 등의 조성 및 함량 변화가 화방에 따라 상이하게 나타났다. LC-ESI-QToF-MS 분석 결과, pelargonidin-3-glucoside, procyanidin C2, procyanidin C3, 및 catechin등이 화방 간 차이를 나타냈으며, 딸기의 저장성과 상관 관계를 나타냈다. 이러한 결과는 딸기 3품종의 화방에 따른 생리적 특성 차이가 저장 중 품질 변화에 영향을 미치며, 화방 정보를 활용한 품질 관리 및 저장성 예측의 기초자료로 활용될 수 있음을 시사한다.

본 성과물은 농촌진흥청 연구사업(PJ01775101)의 지원에 의해 이루어진 것임.
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P1-09

Stepwise recovery of pectin and cellulose from apple pomace through acid-alkaline treatment optimization

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Apple pomace is an abundant agro-industrial by-product containing valuable polysaccharides such as pectin and cellulose. However, efficient recovery of these biopolymers requires controlled extraction conditions. This study investigated a sequential strategy to obtain pectin and cellulose by optimizing acid and alkaline treatments. Apple pomace powder was first washed with deionized water to remove soluble impurities. Pectin was extracted using HCl at 0.5 M or 1.0 M for 1 – 2 cycles, and recovered from the filtrate through ethanol precipitation and washing. The remaining solid residue was used for cellulose recovery. Cellulose extraction was performed using NaOH at 0.5 M or 1.0 M for 2 – 3 cycles, followed by NaClO bleaching and washing. The recovered pectin was evaluated for yield, degree of methoxylation, viscosity, and color, while cellulose was characterized by yield, composition, FTIR, XRD, and TGA analyses. Acid conditions were expected to influence pectin recovery efficiency and structural properties, whereas alkaline conditions affected cellulose purification, crystallinity, and thermal behavior. Overall, this study presents a stepwise extraction process for apple pomace valorization and demonstrates its potential as a sustainable source of functional biopolymers.

P1-10

Upcycling sesame press cake oil through oleogel preparation and physicochemical characterization

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Sesame press cake is a by-product of oil production that retains residual oil but is largely discarded and represents a missed opportunity for high-value utilization. Despite its nutritional value and potential functional applications, sesame press cake remains largely underutilized in conventional oil production processes. In this study, oil was extracted from sesame press cake using solvent extraction and structured into oleogels with wax-based gelators. The oleogel system was designed to create a stable semi-solid matrix capable of preserving the functional properties of the oil. The oleogels were analyzed to assess their functional and physical properties. Evaluations included gel formation, structural integrity, oxidative stability, and antioxidant activity, aiming to explore the potential performance and application of the oleogels as a stable lipid matrix. These analyses were intended to provide insights into how the extracted oil could be utilized in a functional form. This study highlights the potential of sesame press cake as a source of high-value oleogels, providing a sustainable strategy for by-product valorization and potential use in functional food systems. This approach offers a sustainable pathway to utilize underexploited sesame processing residues.

P1-11

이벤트 기반 아키텍처(EDA)를 활용한 농산물산지유통센터(APC) 입하관리 효율화 모듈 개발 및 적용

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국내 농산물산지유통센터(APC)의 입하 과정은 수기·엑셀 중심으로 운영되어 입하 데이터가 시스템에 실시간 반영되지 못하고, 개별 시스템 간 정보연계가 이루어지지 않아 데이터의 공백·단절·지연이 구조적으로 발생한다. 특히 입하현장의 계근 전용시스템과 기 구축·운영 중인 APC 통합 운영시스템(APC Operating System, 이하 AOS; 산지·입하·주문·출하 통합운영) 간에는 실시간 연계체계가 부재하여 입하실적이 수동으로 이중 입력되는 한계가 있다. 이에 본 연구는 계근대 – AOS 간 실시간 데이터 연계체계를 구축하고자 이벤트 기반 아키텍처(EDA)를 설계원칙으로 채택하고, 변경 데이터 캡처(Change Data Capture) 패턴을 적용하여 데이터 변경 이벤트 발생 즉시 하위 시스템이 반응하는 비동기 입하관리 모듈을 개발하였다. 계근완료 이벤트를 트리거로 AOS가 입하 실적을 즉시 확정하고 제조실행시스템(MES)으로 자동 연계하는 파이프라인을 설계·구현하였으며, QR코드 스캔 이벤트를 통해 입하 차량 – 팔렛트 – 창고 간 이력추적 체인과 기준정보 동기화까지 일관된 EDA 구조로 구성하였다. 본 모듈은 기존 AOS에 신규모듈로 통합하여 전남서남부채소농협 무안 APC 실증센터에 적용하였다. 본 모듈 적용으로 계근대 – AOS 간 수동 이중입력 단계가 제거되어, 처리지연이나 데이터 누락 없이 입하실적의 실시간 확정이 가능해졌다. 본 모듈은 특정 계근시스템에 종속되지 않는 EDA 구조로 설계되어 다양한 APC 환경에 이식 가능하며, 이는 향후 전국 APC에 공통 적용할 수 있는 표준 EDA 연계모델로 확장될 수 있음을 시사한다.

본 결과물은 농림축산식품부의 재원으로 농림식품기술기획평가원(고부가가치식품기술개발사업)의 지원을 받아 연구되었음(No. 322054-05).

P1-12

Effect of ice pack configuration in expanded polystyrene boxes on kimchi quality during refrigerated storage after simulated distribution

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This study investigated the effects of ice pack configuration in expanded polystyrene (EPS) boxes on kimchi quality during refrigerated storage after simulated distribution. Kimchi samples for the control (CTL) were stored directly at 4℃, whereas other samples were subjected to simulated distribution at 25℃ for 24 h under different ice pack configurations (1STP, 1SBT, 2STB, and 4SAL), followed by refrigerated storage at 4℃ for 28 days. Changes in temperature, pH, titratable acidity, gas composition, lactic acid bacteria (LAB) counts, microbial communities, and metabolite profiles were evaluated. After 24 h of simulated distribution, 4SAL maintained the lowest kimchi core temperature (4.0℃), followed by 2STB (14.5℃), 1SBT (18.5℃), and 1STP (21.5℃). During refrigerated storage, fermentation progressed more slowly in 4SAL than in other treatments, resulting in suppressed CO_2 accumulation and delayed LAB growth. Microbial community analysis also indicated delayed fermentation in 4SAL, while metabolite profiling revealed differences in fermentation dynamics among treatments. These findings indicate that appropriate ice pack placement within EPS boxes can effectively minimize temperature increases during distribution and maintain kimchi quality during refrigerated storage.

P1-13

Compositional characteristics and quality changes of Atlantic salmon by-products under temperature-abuse

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Atlantic salmon (*Salmo salar* L.) processing generates large amounts of by-products that remain underutilized despite their nutritional values. This study characterized compositional differences among salmon by-products and evaluated quality changes during temperature-abuse storage. The heads contained the highest levels of free amino acids, whereas the skin exhibited a collagen-rich composition with lower free amino acid levels but higher total amino acid content. During storage, total volatile basic nitrogen and microbial counts increased progressively, with marked increases after 24 h, indicating accelerated spoilage. Electronic nose analysis coupled with OPLS-DA clearly differentiated early (0-9 h) and late (24-30 h) storage periods. The late stage was associated with increased signals of nitrogen- and sulfur-containing volatile compounds. These findings indicate that storage stability of salmon by-products is strongly influenced by tissue composition and nitrogen substrate availability, affecting microbial growth and volatile formation under temperature-abuse conditions. These results provide a basis for the quality assessment and utilization of salmon by-products.

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P1-14

Quality changes and spoilage characteristics of olive flounder by-products under temperature-abuse conditions

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Olive flounder (*Paralichthys olivaceus*) processing generates substantial quantities of by-products (head, frame, and viscera). This study investigated their composition and quality deterioration during temperature-abuse storage (30℃). The frame contained the highest calcium content, whereas the viscera showed the highest total free amino acid content. During storage, TVB-N and microbial populations increased markedly, particularly in the viscera. TVB-N increased more than tenfold within 16 h, accompanied by microbial growth exceeding 9 log CFU/g. Image analysis revealed discoloration and structural degradation, while e-nose analysis combined with OPLS-DA discriminated storage stages and highlighted spoilage-associated volatiles. These findings indicate that olive flounder by-products exhibit tissue-specific composition and spoilage characteristics, with viscera showing the greatest susceptibility to deterioration and requiring particular attention for quality management.

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P1-15

Changes in physicochemical properties and non-volatile metabolites of roasted laver (*Neopyropia yezoensis*) during long-term storage under different conditions

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This study investigated the effects of roasted laver (*Neopyropia yezoensis*) during 12 months of storage at different temperatures (4℃ and 25℃) on the physicochemical properties and metabolite profiles. Storage at room temperature (25℃) resulted in significant increases in yellowness (b*) and the browning index, indicating pronounced yellowing, whereas refrigerated storage (4℃) effectively preserved the original color. These visual changes were consistent with the degradation patterns of the major pigments, chlorophyll and phycoerythrin. Furthermore, thiobarbituric acid reactive substances (TBARS), an indicator of lipid rancidity, increased more rapidly under room-temperature storage than under refrigerated storage. During storage, most metabolites showed decreasing trends, whereas lysophosphatidylcholine and lysogalactolipid levels increased significantly. Antioxidant activity showed a strong positive correlation with dehydrated mycosporine-like amino acid (dMAA) levels ($r \geq 0.864$). Furthermore, refrigerated storage extended the half-life ($t_{1/2}$) of individual dMAAs by 1.57- to 2.60-fold compared with room-temperature storage. These findings indicate that refrigerated storage is beneficial for preserving the quality and functional properties of roasted laver.

P1-16

강원지역 배추, 무, 사과, 배 제조가공 부산물 발생 현황 실태 연구

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식품가공 부산물의 대량 발생에도 원료 표준화 미비 및 대량확보시스템 부재로 대부분 폐기 처리되고 있다. 국내 농식품 연간 폐기량은 500만톤(2019년), 처리비용 8천억 원 이상 소요되는 것을 알려져있다. 부산물 발생처리 현황 통계자료 부재로 품목별 생산량으로 부산물량 추정하고 있다. 따라서 원료 유형별 발생량, 폐기량, 재활용률 등 기초 통계자료 구축이 시급한다. 이를 통해 농산부산물의 안정적 공급을 위한 원료 공급모델 개발 및 국가 차원의 수거, 전처리 시스템 구축이 필요하다. 강원지역 2024년 업체 기준 4작목(배추, 무, 사과박, 배박)에 대한 실태조사를 실시하였다. 배추, 무, 사과, 배 표본업체는 각각 16, 10, 11, 8개 업체로 규모를 대, 중, 소로 나누어 조사하였다. 배추의 월평균 사용량은 128.4-160.6톤으로 연중 비슷한 경향을 보였다. 월별 부산물 발생량은 20.5-29.2톤이였다. 무의 월평균 사용량은 99.5-146.4톤으로 1월, 7월에 높았고, 월별 부산물 발생량은 17.3-25.1톤이였다. 사과의 사용량은 9월에서 3월까지 주로 사용되었으며, 15톤-7.2톤 수준이였다. 부산물 발생량은 9월에서 3월까지 1.9톤-3.5톤 수준이였다. 배의 사용량은 10월에서 12월까지 주로 사용되었으며, 0.8-0.2톤 수준이였다. 부산물 발생량은 이 기간 0.1-0.2톤 수준이였다. 배추의 공정별 발생량은 선별 57.1%, 세척 29.5%, 세절 15.3%, 양념 1.3%, 포장 1.0% 였고, 발생량은 선별에서 640.6톤, 세절에서 582.1톤이였다. 무의 공정별 발생량은 선별 65.3%, 세척 3.3%, 세절 5.0%였고, 발생량은 197.3톤, 세절에서 51.6톤이였다. 사과 공정별 발생량은 선별 10.5%, 착즙에서 90.9%였다. 배 공정별 발생량은 선별 10%, 세절 20%, 착즙 90%였다.

P1-17

Mock-load evaluation of drying potential in a differential-pressure onion-curing system

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Stable postharvest onion curing is difficult under Korea's hot, humid, monsoon-dominated June climate, creating a need for a system that can sustain it. This study evaluated the moisture-load response, through-pallet airflow, and internal drying potential of a differential-pressure forced-air curing system (humidifier, dehumidifier, fan, plastic-covered pallet packed with water-free mock load (pool balls)) in a sealed chamber. Under a continuous humidification load of 3.08 kg/h, representative runs at nominal 20, 25, and 30℃ were analyzed from chamber and pallet temperature, relative and absolute humidity, vapor pressure deficit, condensate mass, power, and a 27-point airflow field. Mean airflow velocity was 2.6–3.1 m/s with no stagnant dead zone detected. Chamber relative humidity was drawn down from near-saturation (–95%) to 74.8–77.0%, while inside the pallet it fell further to –50%; the internal pallet vapor pressure deficit reached 2.3–3.4 times the bulk value. The system sustains local drying potential under a mock load even at high chamber humidity, supporting rainy-season onion pallet curing and differential-pressure device design.

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P1-18

생육단계별 기상환경이 사과 '후지'의 품질 특성에 미치는 영향 분석

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기후 변화로 인한 사과의 조기 개화, 냉해, 생육 기간 연장 등은 품질 및 저장성 약화의 원인이 되고 있다. 본 연구는 사과 주산지(보은·장수·청송)의 2025년 기상데이터를 기반으로 생육단계별 품질 특성 간의 상관관계를 분석하여 향후 품질 및 저장성 예측을 위한 기초자료를 구축하고자 하였다. 분석 결과, 개화기(3–4월) 평균기온이 높을수록 개화량(r=.602)과 착과율(r=.804)이 증가했다. 생장–성숙기(4–9월)의 강수량은 수분 공급에 따른 광합성 촉진으로 당도(r=.589)와 정의 상관을 보였다. 이 시기의 높은 상대습도와 강수량은 호흡 억제를 통해 사과산 분해와 세포벽 연화를 지연시켜 산도와 경도를 유지시켰으나, 수확기(10월)의 수분 공급은 희석 효과로 인해 당도·산도·경도를 모두 감소시켰다. 착색의 경우, 평균최저기온은 적색도(r=.490*)와 정의 상관을, 황색도(r=−.767)와는 부의 상관을 나타냈다. 수확기 기온, 일교차, 일조시간은 엽록소 분해를 촉진하여 과피 명도 및 황색도와 고도의 정의 상관관계를 보였다. 종합적으로 본 결과는 생육단계별 기상 데이터를 활용한 사과 '후지'의 선제적 품질예측모델 개발 및 이상기후에 대응한 농산물 유통 관리와 수급 안정화의 기초자료로 활용될 수 있다.

본 연구는 2026년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호:PJ01762103) 및 전문연구원 과정 지원 사업에 의해 이루어진 것임

P1-19

PPWR 준거성 확보를 위한 PCR PE 기반 단일 소재 유연 포장재의 열융착 메커니즘 분석 및 유통 안정성 정량 평가

김고은*, 유하경, 김주한
소프트팩

본 연구는 유럽 PPWR 규제 대응을 위해 PCR PE 기반 단일 소재(Mono-material) 봉투의 설계 최적화 및 유통 안정성 확보를 목적으로 함. 이를 위해 기존 PE 및 PP 단층 필름을 대조군으로 설정하여 온도, 압력, 시간 등 주요 변수에 따른 열융착(Heat-seal) 계면의 강도 특성을 UTM (Universal Testing Machine) 기반 ASTM F88 규격으로 정밀 분석함. 분석 결과, LDPE 계열은 저온 영역에서 우수한 공정 마진을 보였으나 PP 계열은 고온(약 165℃)에서 높은 임계 강도를 나타냄을 확인함. 특히 PCR 함량 증가 시 발생 가능한 미세 오염원 및 물성 저하 영향을 고찰하여 가공 후 실제 물류 환경에서의 유통 안정성 문제를 선제적으로 규명할 수 있도록 결과를 도출해냄 . 결론적으로 본 연구는 유니소재 기반 친환경 포장체의 제조 표준화 가이드를 제시하며 불량률 최적화 및 전과정 탄소 배출 저감에 기여할 수 있음.
본 결과는 2026년 한국식품산업클러스터진흥원 기업기술지원사업의 지원을 받아 수행된 연구임.

P1-20

Antioxidant and absorbent aerogels for active food packaging using purple sweet potato peel extract and subcritical water-treated potato starch

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Marine bioresources and seafood by-products contain a wide range of bioactive components, including phospholipids, proteins, and polysaccharides, and are recognized as promising resources for the next-generation blue food industry. However, their industrial value largely depends on how efficiently they can be recovered in a stable, environmentally friendly manner and how effectively they can be functionally designed for targeted applications. This presentation introduces a marine biomaterial production strategy based on an integrated clean-processing platform combining supercritical carbon dioxide (SC-CO_2) processing with subcritical water treatment. SC-CO_2 processing offers several advantages, including a low critical temperature, non-toxicity, and easy solvent removal, and can be used for the selective recovery of high-purity marine phospholipids and other lipophilic compounds from materials such as conger eel by-products while maintaining the quality of heat-sensitive compounds. In addition, subcritical water treatment can be applied to the structural modification and depolymerization of marine proteins and polysaccharides to improve their functional properties. Materials obtained through this clean-processing platform have potential applications in functional food ingredients, 3D-printable food inks, and antioxidant and antimicrobial smart packaging. However, precise optimization of processing conditions according to the biological diversity of raw materials, as well as the operational stability of scale-up production, remains a challenge for future industrialization. In conclusion, supercritical carbon dioxide-based clean-processing technologies can serve as an important engineering platform for enhancing the value of marine resources, expanding their applications, and supporting the development of sustainable blue food systems.

P1-21

Poly(lactic acid) films incorporated with zinc oxide nanoparticles and lavender essential oil for antimicrobial and lipid oxidation-inhibiting active food packaging

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The development of biodegradable active packaging materials capable of inhibiting microbial growth and lipid oxidation is important for sustainable food packaging. This study developed poly(lactic acid) (PLA)–based active films containing zinc oxide nanoparticles (ZnO) and lavender essential oil (LEO) and evaluated their packaging performance. The incorporation of LEO improved the mechanical properties of PLA films, increasing tensile strength from 37.53 MPa to 51.49 MPa. Among the tested formulations, the film containing 2% ZnO and 2% LEO exhibited the best performance, including enhanced tensile strength, improved oxygen barrier properties, strong antibacterial activity against *Listeria monocytogenes* and *Escherichia coli* O157, and excellent UV–blocking ability. In sunflower oil storage tests, this formulation effectively delayed lipid oxidation, showing the lowest peroxide value, oxidation rate constant, and area under the peroxide value – time curve. XRD and FTIR analyses confirmed that the crystalline structure of ZnO and the primary structure of PLA were maintained after film fabrication. These results suggest that PLA/ZnO – LEO composite films are promising biodegradable active packaging materials for improving microbial safety and oxidative stability of lipid–containing foods.

P1-22

Optimization of pretreatment conditions for long-term storage of *Kalopanax septemlobus* shoots

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Kalopanax septemlobus is a deciduous tree of the Araliaceae family widely distributed in East Asia, including Korea. Its young shoots are consumed as a popular spring wild vegetable and contain bioactive compounds such as saponins, polyphenols, and flavonoids with antioxidant, anti-inflammatory, and immune-enhancing properties. Due to increasing demand for functional foods, the industrial value of the shoots has grown. However, their harvest period is limited to only two to three weeks, creating a need for long-term storage technologies. This study evaluated pretreatment and freezing methods for quality preservation of *K. septemlobus* shoots. Hot-water treatment caused greater tissue damage than steam treatment. To reduce thermal injury, the upper and lower portions of the shoots were treated separately. In addition, sodium chloride immersion before freezing decreased tissue damage and browning. Rapid freezing was more effective than slow freezing in maintaining shoot quality during frozen storage.

P1-23

Development of electron beam irradiation process for shelf-life extension of dried sweet potato

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This study was conducted to develop an electron beam (E-beam) irradiation process for improving the microbiological safety and extending the shelf life of dried sweet potato products. The initial bioburden was determined according to ISO 11737-1, and the verification dose was established following ISO 11137-2 guidelines. Electron beam irradiation was performed at an energy level of 5 MeV and pulse currents ranging from 276 to 358 mA, with absorbed doses of 1, 3, 5, 7, and 10 kGy. The initial bioburden was 6.3×10^4 CFU/g, and approximately 5D reduction was required to achieve the target microbial level of less than 1 CFU/g. Total aerobic bacterial counts decreased from 17,000 CFU/g in the non-irradiated control to 3,000, 500, and 50 CFU/g following irradiation at 1, 3, and 5 kGy, respectively. No viable bacteria were detected after treatment at 7 and 10 kGy. Coliforms, *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus cereus* were not detected in any treatment group, while *Salmonella* spp. and *Listeria monocytogenes* were negative throughout the study. Dose distribution evaluation confirmed uniform irradiation across the product and packaging units. These results indicate that 7 kGy electron beam irradiation is an effective processing condition for enhancing the microbial safety and storage stability of dried sweet potato products.

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P1-24

Artificial intelligence model using peel coloration images of stored Fuji apples for non-destructive sugar content prediction

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Although the correlation between apple peel coloration and sugar content is known to be of low significance, studies on non-destructive sugar content prediction models based on RGB images, which improve prediction accuracy using artificial intelligence techniques, have recently been actively conducted. This study developed an image-based artificial intelligence model to predict the post-harvest quality of Fuji apples. Methodologically, to maximize object extraction accuracy in the image preprocessing stage, a combined YOLO and SAM (Instance Segmentation) model was utilized instead of the traditional OpenCV method. This allowed for the precise segmentation of the apple area by eliminating background interference. Furthermore, to reflect consumer-oriented quality indicators, sensory evaluations were conducted to establish a 3-tier grading system for firmness (≤45N, 50-60N, ≥65N), sugar-acid ratio (≤54, 55-65, ≥66), and sugar content (low, medium, and high, based on thresholds of 12 Brix and 14 Brix). Based on these criteria, two images exhibiting the largest difference in coloration within a single fruit were extracted. The dataset was then partitioned into training and testing sets at an 8:2 ratio to train a CNN-based ResNet50 classification model according to the coloration differences. The results indicated that the image extraction model based on YOLO and SAM achieved a high segmentation accuracy of 0.82 based on mAP50. In the validation of the sugar grade prediction model, the accuracy was 0.688 with an F1-score of 0.684. Notably, the recall for identifying low-sugar apples was outstanding at 0.9. Additionally, weight loss prediction applying the Elastic Net model demonstrated a high correlation of 0.79. In conclusion, this study demonstrated that image-based artificial intelligence techniques can be highly effective in accurately predicting and managing the post-harvest quality grades of apples.

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P1-25

Effects of packaging materials and rapid freezing-assisted frozen storage on the quality characteristics of dried persimmons

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Dried persimmons are susceptible to quality deterioration during storage because of moisture migration, browning, texture softening, and microbial growth. This study evaluated the effects of packaging materials and rapid freezing–assisted frozen storage on the quality characteristics of dried persimmons during 16 weeks of storage. Samples were packaged in polypropylene (PP), polyethylene (PE), and oriented polypropylene (OPP), and stored at 25℃, 0℃, and −25℃. Additional samples were rapidly frozen at −40℃ or −70℃ for 24 h prior to storage at −25℃. Moisture content, water activity, pH, total soluble solids, total acidity, color, browning index, texture, and microbial counts were analyzed throughout storage. Quality deterioration was greatest at 25℃, showing higher moisture content, water activity, browning, and microbial counts, whereas frozen storage effectively maintained physicochemical and microbiological quality. Among the packaging materials, OPP showed relatively better moisture barrier properties and quality retention than PP and PE during storage. Rapid freezing followed by frozen storage further reduced quality deterioration compared with storage at higher temperatures. These findings suggest that appropriate selection of packaging materials together with rapid freezing–assisted frozen storage can improve the storage stability of dried persimmons and provide fundamental information for commercial storage and export distribution.

PART 2 Food Processing and Quality

P2-01

Physicochemical quality characteristics of low-temperature pressed soybean oil

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This study was conducted as part of efforts to expand the utilization and consumption of domestic soybean resources in Korea by evaluating the quality characteristics of low-temperature pressed soybean oil compared with refined soybean oil. Total tocopherol and phytosterol contents in low-temperature pressed soybean oil were approximately 1.48 times higher than those in refined soybean oil, mainly due to higher γ-tocopherol, δ-tocopherol, and β-sitosterol contents. Low-temperature pressed soybean oil also exhibited approximately 4.75-fold higher antioxidant activity than refined soybean oil, suggesting that non-refining processing retained functional minor components associated with antioxidant properties. In contrast, refined soybean oil showed lower acid value and peroxide value, indicating improved oxidative stability through refining. Color analysis revealed that low-temperature pressed soybean oil had higher redness and yellowness values, likely due to the presence of unrefined bioactive compounds. These results suggest that low-temperature pressing is effective for retaining functional compounds and antioxidant activity in soybean oil, and may provide useful information for promoting value-added utilization of domestic soybeans.

P2-02

Effects of sorbitol treatment on the essential amino acid composition of *Tenebrio molitor* Larvae

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Tenebrio molitor (TM) larvae are considered a sustainable, high-quality protein source with a rich essential amino acid (EAA) profile. However, most previous studies have focused on breeding, rearing, or extraction processes, whereas limited attention has been paid to pre-treatment strategies for enhancing EAA levels in whole TM materials. In this study six sugar alcohols were evaluated at concentrations of 0-20% (w/v) to establish an optimal pre-treatment condition for EAA enrichment. Among the tested polyols, 10% (w/v) sorbitol soaking was identified as the most effective pre-treatment for EAA enrichment. To verify the efficacy, TM were processed under accelerated conditions at 45℃ for 40 days. Samples were collected on days 10, 20, and 40 to analyze crude protein, amino acids, lipids, and antioxidant activity of the processed TM. Results demonstrated that sorbitol immersion increased the total EAA content of TM by 33.1% (from 542.8 to 722.6 mg/100g). Specifically, L-methionine, threonine, and leucine levels rose by 4.1, 1.9, and 1.7-fold, respectively. By day 40, the treated group exhibited 3% higher DPPH radical scavenging activity (27% at 500 μg/mL) than the control, while maintaining stable unsaturated fatty acid profiles and surface color. These findings suggest that sorbitol immersion can be used as a simple pre-treatment strategy to enhance the EAA content and nutritional value of TM larvae. This approach may support the development of EAA-enriched TM ingredients for high-value protein-supplemented and specialized food applications.

P2-03

Development of agar-based bioplastic films reinforced with lignin-containing cellulose microfibrils derived from *kimchi* cabbage by-products

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This study aimed to fabricate lignin-containing cellulose (LCC) from *kimchi* cabbage by-products (KCB) using deep eutectic solvent (DES) pretreatment to enhance the properties of agar-based bioplastic films. Specifically, DESs were formulated using a combination of choline chloride and oxalic acid as hydrogen bond acceptors and donors, respectively. Powdered LCCs were extracted up to 46.4% from the outer leaves of high-moisture KCB throughout DES pretreatment, followed by freeze-drying. The powdered LCC, comprising 61.9% cellulose and 16.5% lignin, exhibited excellent colloidal stability with a ζ-potential of −26.7 mV and high thermal resistance, peaking at T_{max} of 353℃. Agar-based bioplastic films were developed by incorporating varying concentrations of powdered LCCs (1, 3, 5, and 10% w/w) to evaluate their reinforcing effects on the agar films. Among the tested formulations, the film reinforced with 5% LCCs achieved optimal mechanical performance, with a tensile strength of 25.7 MPa. In conclusion, the successful extraction of LCC using choline chloride and oxalic acid-based DES and its effective integration into agar matrices suggest a viable pathway for upcycling KCB into functional bioplastic materials.

P2-04

Chemical and bioactive properties and microbial contamination of kimchi cabbage by-products: Seasonal and process-dependent changes

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Kimchi cabbage by-products (KCB), accounting for approximately 20 – 30% of fresh *kimchi* cabbage input at commercial *kimchi* plants in Korea, are discarded as industrial waste. A crushing/dehydration system converts outer cabbage leaves (OCL) and salted cabbage pieces (SCP) with high moisture content (MC) into condensed KCB solids (CKS), reducing the volume and MC of KCB. This study compared the chemical and bioactive properties and microbial contamination levels of three types KCB collected from the plant in fall and winter of 2025. The soluble solid content of winter SCP was 7.5 ° Brix, higher than that of fall SCP. Regardless of season, the MC was higher in OCL than in the SCP and CKS. In contrast, the highest total aerobic bacteria and coliforms counts of 7.9 and 5.5 log CFU/g were observed in CKS. Total phenolic content of OCL collected in fall and winter was 0.8 and 0.4 mg GAE/g, respectively, surpassing those of SCP and CKS collected in both seasons. No differences in total glucosinolate content (TGC) were observed between OCL and CKS in either season, whereas SCP showed lower TGC (each 1.4 and 2.4 mg SE/g) than OCL and CKS. Overall, these results provide baseline data for KCB upcycling into eco-friendly materials, offering insights into seasonal and processing-specific characteristics for resource-efficient by-product utilization.

P2-05

Packaging-driven atmosphere formation and tissue-specific quality profiling of fresh ginseng from farmer-grade sorting through subzero storage

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Fresh ginseng is handled as a visually heterogeneous root commodity, and farmer-level sorting often considers root size, branching, fibrous-root development, and apparent market use before washing and storage. This study evaluated how such field-derived heterogeneity is expressed during subzero storage when roots are processed through a practical postharvest workflow. Six-year-old fresh ginseng harvested from a contiguous commercial field segment in Chungju, Korea, was sorted using a farmer-relevant seven-class scheme, commercially washed, in-machine drained/dried, assigned to washed-control or post-wash peracetic acid spray treatment, final air-dried on trays, packaged in PE50 or PE30/OPP30 film, and stored at −2℃. Packaging film was the dominant factor shaping the storage environment. Compared with PE50, PE30/OPP30 generated a stronger modified atmosphere with lower O_2 and higher CO_2 and was associated with reduced long-term mass loss. In contrast, post-wash PAA did not consistently improve physicochemical quality, indicating that it should be interpreted primarily as a sanitation-oriented step under the present conditions rather than as a direct quality-retention treatment. Tissue-level responses revealed a clear separation between water status and chemical-marker distribution. Fine roots showed the lowest and most variable moisture status, indicating high dehydration susceptibility, but they also contained the highest Rg1 and Rb1 concentrations. The main root body showed comparatively lower targeted ginsenoside levels. Rg1 and Rb1 were strongly associated with each other, whereas their pattern did not simply duplicate DPPH and TPC responses, suggesting that antioxidant-related traits and targeted ginsenoside markers describe complementary aspects of tissue-specific quality. These results suggest that fresh-ginseng storage performance should be evaluated through an integrated field-to-package perspective. Farmer sorting, package atmosphere, tissue-level water relations, and ginsenoside distribution together provide a practical basis for improving storage management and postharvest quality evaluation of fresh ginseng under subzero distribution.

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P2-06

수용화 커큐민 부산물의 이화학적 특성 분석 및 고부가가치 업사이클링(Upcycling) 공정 연구

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항염 및 면역 증진 효능이 뛰어난 커큐민의 체내 흡수율을 개선하기 위해 스테비올배당체를 활용한 수용화 공정이 널리 적용되고 있다. 그러나 이 과정에서 다량의 미가용화된 진흙 형태의 커큐민 부산물이 발생하여 전량 폐기되는 산업적 한계가 존재한다. 본 연구는 이러한 수용화 커큐민 부산물을 고부가가치 기능성 소재로 업사이클링(Upcycling)하는 친환경 자원화 공정 기반 구축을 목적으로 수행되었다. 이를 위해 생산 공정의 필터 하우징 내에서 부산물을 원활히 회수하고, −20℃ 이하에서 즉시 냉동 보관하는 초기 전처리 및 불순물 제거·균질화 공정을 확립하였다. 회수된 부산물은 동결건조 및 분무건조 방식을 통해 분말화하여 공정별 건조 효율성을 비교하였으며, 기기 분석을 통해 핵심 유효성분인 커큐민과 스테비올배당체의 함량 변화를 정량적으로 평가하였다. 또한, 식품 소재로서의 안전성 확보를 위해 중금속 및 미생물 규격을 설정하고 분산 안정성과 수분 활성도를 분석하였다. 이를 바탕으로 가축 면역력 강화용 첨가제 및 지역 특산물(정읍 쌍화탕 등)과 연계한 기능성 식품 소재로서의 적용 가능성을 검증하였다. 본 연구는 커큐민 부산물의 자원재활용을 통해 원료 이용 효율을 15–20% 향상시키고 산업 폐기물을 저감함으로써, 중소 식품기업에 적합한 친환경 자원순환 공정 모델을 제시한다는 점에 의의가 있다.

P2-07

Quality characteristics and antioxidant activity of Korean candied cherry tomatoes according to sugar composition

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This study was conducted to compare the effects of different types of sugars on the quality characteristics and functional properties of Korean candied cherry tomatoes and to provide basic data for their production using oligosaccharides, alternative sugars, and mixed sugars. The treatments consisted of a control, allulose, isomaltooligosaccharide, sucrose + allulose, and sucrose + isomaltooligosaccharide. Korean candied cherry tomatoes were prepared by hot-air drying at 70℃ for 7.5 h. The pH, total acidity, soluble solids content, color values, DPPH radical scavenging activity, and total polyphenol content of the prepared samples were analyzed. The results showed that the sugar-treated groups had higher pH and lower total acidity than the control, indicating a tendency toward reduced sourness. The soluble solids content was highest in the allulose treatment, and the color values differed depending on the sugar composition. DPPH radical scavenging activity and total polyphenol content were highest in the control; however, the allulose treatment maintained relatively high antioxidant activity among the sugar-treated groups. These results suggest that allulose may be a useful sugar material for reducing sourness while maintaining the functional properties of Korean candied cherry tomatoes.

P2-08

Quality characteristics and antioxidant activity of fermented apple beverage according to apple juice addition and filtration

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This study was conducted to compare the effects of apple juice addition and filtration on the quality characteristics and antioxidant activity of a fermented beverage prepared using glutinous rice and white koji. The treatments were divided into filtered and non-filtered groups, and the fermented beverages were prepared with different mixing ratios of apple juice and beverage base. The pH, acidity, color values, soluble solids content, DPPH radical scavenging activity, and total polyphenol content of the beverages were analyzed. The results showed that pH was relatively higher in the filtered group, while acidity was highest in the non-filtered control. Soluble solids content was generally higher in the non-filtered group, with the highest value observed in the non-filtered control. For color values, lightness and yellowness tended to be higher in the non-filtered group. DPPH radical scavenging activity was markedly increased in the apple juice-added treatments compared with the control, and total polyphenol content tended to be higher in the non-filtered group. These results indicate that apple juice addition and filtration affected the physicochemical characteristics and antioxidant activity of the fermented beverage.

P2-09

Effects of *Tenebrio molitor*, *Protaetia brevitarsis*, and *Gryllus bimaculatus* proteins on the fibrous structure formation of high moisture meat analogues

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High moisture meat analogue (HMMA) is protein-based meat alternatives produced by high moisture extrusion to mimic the structure and texture of conventional meat. However, simultaneously improving nutritional value and forming desirable fibrous structures remains a major challenge. In this study, edible insect proteins derived from *Tenebrio molitor* (TM), *Protaetia brevitarsis* (PB), and *Gryllus bimaculatus* (GB) were incorporated at 4% and 8% levels into soy-gluten-based HMMAs during extrusion. The addition of edible insects increased the content of essential amino acids such as Ile, Met, and Val. Regarding intermolecular forces, hydrogen bond and disulfide bonds increased, whereas hydrophobic interaction was decreased by insect protein addition. Among them, TM showed the highest degree of disulfide bonds, resulting in a dense structure. Texturization index and hardness showed the highest value with 4% TM, and fibrous structure was also observed in SEM image. However, 8% TM and other insect proteins had lower texturization index due to the less robust structure. Particularly, GB showed the lowest thermal denaturation enthalpy regardless of addition levels. Consequently, 4% TM may be the most suitable to improve physicochemical properties and fibrous structure of HMMA.

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P2-10

원료 처리 조건에 따른 가루쌀 발효주의 품질 및 기능성 특성 분석

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가루쌀(바로미2)은 물에 불리지 않고도 건식 제분이 가능한 품종으로 최근 다양한 식품 소재로 주목받고 있다. 양조에 일반적으로 사용되는 멥쌀과 비교하여 가루쌀 고유의 특성을 반영한 양조 공정 연구는 아직 미흡한 실정이므로 본 연구에서는 1단 담금 시 쌀의 원료 처리 방식(증자, 무증자, 익반죽, 구멍떡)을 달리하여 발효주를 제조하고 그 품질 특성을 비교함으로써 가루쌀에 적합한 양조 조건을 구명하고자 하였다. pH 및 산도 분석 결과 각각 4.13–4.72, 0.36–0.50%로 무증자한 처리구에서 산도가 가장 높게 나타난 반면 당도는 반대의 결과를 보였다. 알코올 함량은 11.0–12.8%로 증자한 처리구에서 가장 낮았다. 관능평가 결과, 원료 처리 방식에 따른 전반적인 기호도는 통계적인 유의차를 나타내지 않았다. 기능성 성분 분석 결과 항산화 활성을 포함한 총폴리페놀 및 총 플라보노이드 함량 모두 무증자 처리구에서 가장 높게 조사되었다. 특히 탄닌 함량은 증자 처리구(39.97 mg%)에 비해 무증자 처리구(74.89 mg%)에서 약 2배가량 높게 나타나 발효주의 바디감과 풍미 형성에 긍적적인 영향을 미칠 것으로 사료된다. 이를 통해 가루쌀을 활용하여 이양주를 제조할 경우 1단 담금을 무증자 방식으로 제조하는 것이 가장 적합한 양조 조건임을 확인하였다.

P2-11

Effect of drying methods on the quality characteristics of apple pomace

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This study investigated the effects of different drying methods on the quality characteristics of apple pomace, a by-product generated during apple juice processing, to evaluate its potential as a value-added food ingredient. Apple pomace was subjected to cold-air drying at 45℃, hot-air drying at 60℃ and 75℃, and freeze-drying, and compared with an untreated control. The pH values ranged from 3.53 to 5.04, while soluble solid contents ranged from 0.6 to 2.7 ° Brix. Lightness (L*) decreased after drying compared with the control. Antioxidant activities and functional compound contents were significantly affected by drying conditions. The hot-air drying treatment at 75℃ exhibited the highest ABTS (83.69%) and DPPH (70.32%) radical scavenging activities, whereas the cold-air drying treatment showed the highest total polyphenol (1,768.68 mg/100ml) and flavonoid contents (193.68 mg/100ml). Overall, dried apple pomace exhibited enhanced bioactive properties compared with the untreated control, although the optimal drying condition varied depending on the target functional component. These findings suggest that appropriate drying processes can improve the utilization value of apple pomace and provide fundamental information for its application as a functional food ingredient.

P2-12

Effect of pretreatment and rice variety on the quality characteristics of Korean traditional wines added with Campbell Early grape

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The objective of this study was to compare the quality characteristics and functional properties of Korean traditional wines added with Campbell Early grape. The samples were prepared as follows: control without grape addition, CA−1 (grape juice added to common rice), CA−2 (100℃ heat−treated grape added to common rice), CA−3 (121℃ high−temperature and high−pressure treated grape added to common rice), CB−1 (grape juice added to the rice flour cultivar 'Baromi 2'), CB−2 (100℃ heat−treated grape added to 'Baromi 2'), and CB−3 (121℃ high−temperature and high−pressure treated grape added to 'Baromi 2'). The pH values were higher in the rice flour fermented rice wine samples than in the common rice samples, whereas total acidity ranged from 0.87% to 1.03% and alcohol content ranged from 10.0% to 15.6%. Tannin and total flavonoid contents were highest in the rice flour fermented rice wine supplemented with heat−treated Campbell Early grape, reaching 83.60 and 25.54 mg/100 mL, respectively. ABTS radical scavenging activity was high in CB−1 (77.79%) and CB−2 (78.21%), whereas DPPH radical scavenging activity was high in CB−1 (90.20%) and CB−3 (89.93%). In sensory evaluation, CB−2, prepared with the rice flour cultivar 'Baromi 2' and 100℃ heat−treated grape, showed the highest overall acceptability.

P2-13

Effect of blending ratio of high-amylose rice and high-β-glucan barley on the texture and starch digestibility of cooked barley rice

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This study evaluated the quality characteristics and starch digestibility of cooked barley rice prepared by blending high-amylose rice and high-β-glucan barley. Domestic barley cultivars (Betahealth and Nurichal) were blended with high-amylose rice (Singil) and conventional rice (Samgwang) to assess their potential as functional food materials. Samples were prepared at different barley blending ratios and divided into four treatments: control (0% barley, 100% rice) and barley-rice mixtures containing 30% and 50% barley. Texture analysis showed that hardness was higher in samples containing Singil and Betahealth than in those containing Nurichal. Adhesiveness was highest in the 30% barley mixture, while springiness increased with barley content. Starch digestibility was evaluated by measuring rapidly digestible starch (RDS), slowly digestible starch (SDS), and resistant starch (RS). Singil showed a higher SDS proportion (20.9%, w/w) than Samgwang (5.3%, w/w). Barley rice containing Betahealth showed higher RS and lower RDS contents. Among all treatments, the 7:3 blend of Singil and barley showed the highest SDS content. These results suggest that Singil and Betahealth may be useful functional grain materials for low-glycemic food applications.

P2-14

Enhancement of polyphenol extraction from secondary pear by-products using physical-assisted extraction methods

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Pear by-products are rich in bioactive substances, particularly phenolic compounds with antioxidant and disease-preventive effects. This study aimed to recover phenolic compounds from secondary pear by-products using various physical extraction methods: microwave-assisted extraction (MAE), high-pressure assisted extraction (HAE), ultrasound-assisted extraction (UAE), and pulsed electric field-assisted extraction (PEFE). The results showed that UAE yielded the highest total phenolic content (TPC, 3.24 mg/g), total flavonoid content (TFC, 14.09 mg/g), and ABTS radical scavenging activity (71.7%). While DPPH radical scavenging activity generally decreased following physical treatments compared to the control, MAE maintained an activity level (79.2%) comparable to the control. Interestingly, combined treatments were less effective than single treatments. HPLC-DAD analysis revealed that the arbutin content increased by 36.46% in UAE samples compared to the untreated control. Furthermore, UPLC-PDA analysis demonstrated that HAE increased the contents of quercetin and epigallocatechin by 11.39% and 28.13%, respectively. These findings suggest that physical extraction methods effectively recover polyphenols from pear by-products, highlighting their potential as functional materials.

P2-15

Effects of ultrasonic power and scale-up processing on the dispersibility and physicochemical properties of rice flour

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This study was carried out to investigate the effects of ultrasonic power on the dispersibility and physicochemical properties of rice flour under scale-up conditions. A 20 L rice flour suspension (10%, w/v) was gelatinized and treated with ultrasound at amplitudes of 40, 60, and 80% for 10 – 60 min. Freeze-dried samples were analyzed for dispersion stability, hydration, pasting, and rheological properties. Water absorption index and swelling power decreased with increasing ultrasonic intensity, whereas water solubility index at 25 and 90℃ increased. RVA analysis showed decreases in peak, trough, breakdown, final, and setback viscosities with increasing intensity. Rheological measurements revealed decreases in the consistency index (K) and apparent viscosity (η 50), while the flow behavior index (n) increased. All samples exhibited n values below 1, indicating shear-thinning behavior. These results suggest that ultrasonic treatment partially disrupted starch structure, reducing viscosity and swelling capacity while improving flowability. Stable dispersion was maintained under scale-up conditions, indicating the potential of ultrasonically treated rice flour for application in rice-based beverages.

P2-16

Quality characteristics of commercial Gyeonggi-do style *kimchi* products

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This study analyzed the quality characteristics of 10 commercial Gyeonggi-do style kimchi products. Samples were classified into two groups: fresh *kimchi* evaluated immediately after purchase, and aged kimchi stored at room temperature for 15 h, followed by aging at 4℃ for 2 weeks. Physicochemical properties, including appearance, pH, titratable acidity, salinity, soluble solids contents, moisture content, microbiological characteristics, and sensory attributes, were evaluated to compare quality changes during fermentation. The results showed that pH decreased while titratable acidity increased in all samples, indicating normal fermentation progression. Differences in color changes before and after fermentation were observed among samples, and some samples exhibited markedly increased ΔE values. Sensory evaluation indicated that *kimchi* with a well-balanced sweetness and umami taste and a relatively mild jeotgal flavor was considered more suitable as Gyeonggi-do style *kimchi*. In contrast, samples with higher salinity and acidity tended to receive lower preference scores. These findings provide fundamental data for understanding the quality characteristics of Gyeonggi-do style *kimchi* and may contribute to the standardization and development of region-specific *kimchi* products.

P2-17

식물성 단백질 제품 개발을 위한 두류 침지시간에 따른 유효성분 분석

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식물성 단백질은 건강보조식품, 이유식 및 기능성 식품 소재 등으로 활용 범위가 확대되고 있으며, 동물성 단백질을 대체할 수 있는 지속가능한 소재로 주목받고 있다. 특히 클린라벨, 고단백, 저가공 및 지속가능성을 중시하는 소비 경향과 맞물려 식물성 단백질 소재에 대한 수요가 증가하고 있다. 본 연구에서는 식물성 단백질 제품 개발을 위한 기초자료를 확보하고자 두류의 침지시간에 따른 유효성분 및 항산화 활성 변화를 분석하였다. 실험 재료는 서리태와 백태를 혼합하여 사용하였고, 침지시간은 0, 2, 4, 8, 12시간으로 설정하였다. 각 시료는 설정 시간별로 찬물에 침지 후 40분간 가열하고 냉각한 뒤 동결건조하여 분석에 사용하였다. 분석 항목은 일반성분, 아미노산, 이소플라본 함량 및 DPPH 라디칼 소거 활성으로 하였다. 분석 결과, 단백질 함량은 12시간 침지구에서 무침지구보다 약 2% 높게 나타났다. 반면 아미노산 함량과 DPPH 라디칼 소거 활성은 침지시간이 짧을수록 높은 경향을 보였다. 이소플라본 함량은 2시간 및 12시간 침지구에서 높았고, 무침지구에서 가장 낮았다. 이상의 결과를 종합하면, 두류를 약 2시간 침지하는 조건이 유효성분 보존과 항산화 활성을 고려한 식물성 단백질 소재 가공에 적합할 것으로 판단된다. 본 연구 결과는 두류 기반 식물성 단백질 제품의 전처리 및 가공 공정 설정을 위한 기초자료로 활용될 수 있을 것으로 기대된다.

P2-18

Development of gum-based vegan mayonnaise: Focusing on *in vitro* oral behavior

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Vegan mayonnaise, in which egg yolk is replaced with plant–based ingredients, has attracted increasing attention with the growing popularity of vegan diets. Thus, in this study, vegan mayonnaise was formulated using gum complexes with varying oil contents, and its physicochemical properties before and after digestion were evaluated. Compared with vegan mayonnaise containing 40% oil, vegan mayonnaise containing 60% oil exhibited enhanced structural stability, characterized by increased storage modulus and recovery rate owing to the higher oil content. During in vitro oral digestion, the fabricated vegan mayonnaises showed no significant changes in particle size after digestion. In contrast, commercial mayonnaises exhibited increased particle size and flocculated oil droplets after digestion, particularly commercial vegan mayonnaise containing starch. These results suggest that oil content did not substantially influence the quality changes of mayonnaise during digestion, whereas ingredient composition had a greater impact on oil droplet stability. Overall, these findings provide guidelines for the development of hydrocolloid gum–based vegan mayonnaise with improved stability during digestion.

P2-19

Evaluation of thermal characteristics across to retort system types and product conditions

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Retort sterilization is an essential thermal process for ensuring the safety and commercial sterility of low-acid foods. However, F_o values and cold spot distribution may vary depending on retort system type and product characteristics. This study evaluated the effects of retort processing conditions on thermal distribution and heat penetration behavior. Heat distribution tests were conducted using three types of retort systems: steam retorts, water immersion, and hot-water spray. Temperature data loggers were placed at multiple points in the retort chamber to assess temperature uniformity and identify cold spot locations. Heat penetration tests were also performed under different product conditions, including product weight, solid content, and product type. F_o values were calculated from time-temperature profiles and compared according to each processing condition. The results showed that temperature distribution patterns and cold spot locations differed depending on retort system type. In heat penetration tests, F_o values varied according to product weight, solid content, and product type, indicating that product characteristics significantly influence heat transfer behavior during retort sterilization. These findings suggest that both equipment-related factors and product-related factors should be considered when establishing and validating retort sterilization processes. Evaluation of F_o values and cold spot distribution may provide a scientific basis for improving thermal process control and ensuring the reliability of retort sterilization.

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P2-20

Physicochemical quality and sensory characteristics of steamed potatoes from nine Korean cultivars

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This study compared the physicochemical quality and sensory characteristics of steamed potatoes from nine Korean cultivars. Steamed samples were analyzed for proximate composition, free sugars, and descriptive sensory attributes, while RVA analysis of raw potatoes was used to estimate gelatinization–related pasting behavior. Moisture and carbohydrate contents ranged from 72.95 to 78.21% and 19.93 to 23.37%, and crude fat was low. Sucrose was the predominant free sugar. Chubaek (CB) and Daeji (DJ) had high total free sugar contents, whereas Doobak (DB) and Daeseo (DS) had the lowest reducing sugar contents. RVA profiles differed among cultivars. Sensory analysis showed significant differences in 17 of 19 attributes. Flavor profiles were differentiated by cabbage–like, chestnutty, and roasted notes, while texture profiles were characterized by hardness and denseness, crumbliness and mealiness, and moistness. DS, DB, and Goldenball (GDB) were firm and dense, Sumi (SM) was mealy and crumbly, and CB, Seo Hong (SH), and DJ were more moist. As these traits may be influenced by genotype–by–environment interactions, multi–year and multi–location evaluations are required to confirm cultivar–specific stability. These findings support cultivar selection by eating quality and suitability.
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P2-21

Optimization of a Pulsed Electric Field (PEF)-based polyphenol extraction process for upcycling onion by-products

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Onion peel, a major by-product of onion processing, is often discarded despite being a rich source of polyphenols. This study aimed to optimize a Pulsed Electric Field (PEF)-assisted extraction process for recovering polyphenols from onion peel and enhancing the utilization of agricultural by-products. Electric field intensity, treatment time, and ethanol concentration were selected as independent variables, and total polyphenol content (TPC) was used as the response variable. Response Surface Methodology (RSM) was employed to determine the optimal extraction conditions. The optimized conditions were identified as 3.2 kV/cm electric field intensity, 12 sec treatment time, and 20% ethanol concentration, yielding a maximum TPC of 29.44 mg GAE/g. Furthermore, high-performance liquid chromatography (HPLC) was conducted to investigate the extracted polyphenolic compounds. Quercetin, myricetin, and rosmarinic acid, the major polyphenols in onion peel, were successfully identified. These findings demonstrate the feasibility of utilizing onion peel as a sustainable source of bioactive compounds and highlight the potential of PEF technology as an environmentally friendly and energy-efficient extraction method for agricultural by-product valorization and functional ingredient development.

P2-22

Effects of thermosonication on the structural, functional properties, and antioxidant activity of mealworm (*Tenebrio molitor*) protein

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Thermosonication, a combination of heat and ultrasound treatment, is an effective non-conventional processing method capable of modifying protein structure and improving functional and antioxidant properties. This study evaluated the effects of thermosonication, combining mild heating (60℃ for 30 min) with varying ultrasound power levels, on the structural, physical, functional, and antioxidant properties of mealworm protein compared with native and heat-treated samples. FTIR analysis revealed no significant changes in major chemical functional groups, whereas circular dichroism showed substantial alterations in secondary structure. Thermosonication reduced the α-helix content from 23.80% to 1.84% and increased the β-sheet content to 46.87%, indicating extensive protein unfolding. These structural changes were accompanied by a decrease in free sulfhydryl content to 13.50 μmol/g protein and a reduction in particle size to 127.20 nm at the highest ultrasound power (HU600). Increased surface hydrophobicity resulting from thermosonication contributed to improved functional properties. Protein solubility reached 59.81%, while the emulsifying activity index (EAI) and emulsifying stability index (ESI) increased to 109.80 m^2/g and 17.50 min, respectively. Additionally, thermosonication enhanced the antioxidant activity of mealworm protein by up to 84.1%. Overall, thermosonication induced favorable structural modifications that enhanced the functional and antioxidant properties of mealworm protein, supporting its potential application in food systems.

P2-23

Quality characteristics of Tteokbokki Tteok (rice cake) prepared from floury rice cultivar

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Floury rice has a softer endosperm than conventional rice, making it suitable for dry milling. This property can improve processing efficiency and expand its use in rice-based processed foods. In particular, tteokbokki tteok is one of the major rice-based processed foods, and their quality may vary depending on rice cultivar and milling status. In this study, Tteokbokki Tteok samples were prepared using white and brown rice of Baromi 2 and Baromi 4, with Samgwang used as a control. All samples had a generally uniform extruded shape. The moisture content of the Baromi 2 and Baromi 4 samples ranged from 46.47 to 47.35%, which was slightly lower than that of Samgwang (48.08%). Tteokbokki Tteok prepared with brown rice of Baromi 2 (brown) and Baromi 4 (brown) showed lower lightness and higher redness and yellowness than those prepared with white rice and Samgwang. Texture analysis showed that Baromi 2 (white) and Baromi 4 (white) had higher hardness than Samgwang. During aging, floury rice samples showed hardness values similar to or higher than those of Samgwang after 12 h of storage. These results suggest that Baromi 2 and Baromi 4 have potential as processing rice materials for Tteokbokki Tteok production.

P2-24

Effects of puffing condition on bioactive compounds and antioxidant activities of Yeongyoja (aerial bulbil of *Dioscorea polystachya*)

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Yeongyoja, the aerial bulbil of *Dioscorea polystachya*, is an agricultural by-product that was recognized as a food ingredient in 2016 and is expected to have potential as a functional material. However, studies on changes in its functional compounds and antioxidant activities according to processing conditions remain limited. In this study, the crude saponin content, total polyphenol and flavonoid contents, and DPPH and ABTS radical scavenging activities of Yeongyoja extracts were analyzed according to puffing temperature (120–140℃). As a result, crude saponin content, total polyphenol and flavonoid contents, and DPPH and ABTS radical scavenging activities increased with increasing puffing temperature. In particular, the crude saponin content was highest in the 140℃ puffing treatment group, reaching 4.94 mg/g. The total polyphenol and total flavonoid contents were also highest at 140℃, with values of 2.39 mg GAE/g and 1.77 mg QE/g, respectively. In addition, DPPH and ABTS radical scavenging activities were highest in the 140℃ treatment group, at 64.04% and 86.95%, respectively. These results suggest that puffing treatment can be used as a pretreatment process to enhance the bioactive compound content and antioxidant activity of yam bulbil, and that 140℃ was found to be the most effective puffing temperature.

P2-25

전남지역 배추, 배 가공 중 부산물 발생현황

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농산물의 가공과정에서 발생하는 부산물은 기능성 소재, 자원화 원료로 활용할 수 있는 가능성이 있으나 기초자료가 부족한 실정이다. 본 연구에서는 전남의 배추와 배 가공제품 중 김치(절임 배추 포함), 배 음료 제조업체를 대상으로 부산물의 발생 및 처리현황을 조사하였다. 월평균 배추 사용량은 53.0-256.2톤으로 11-12월에 가장 많은 원료를 사용하고 있었다. 배는 7월에 4.6톤으로 낮았고, 10월에 161.8톤으로 가장 높아 재배 시기와 관련이 있는 것으로 생각되었다. 월별 발생률은 배추와 배가 각각 16.5-23.3%, 25.7-31.6%로 배가 높았다. 공정별 발생률은 배추에서 절임>세절>선별>세척>양념의 순으로 나타났고, 종류는 외엽, 뿌리, 절임 부산물이었다. 배는 착즙>선별 순이었으며, 대부분 착즙박이었다. 처리 방법은 배추는 폐기물 위탁처리, 배는 자체 활용하는 비중이 높았는데, 이는 가공업체의 규모에 따른 차이로 판단되었다. 조사 업체에서는 부산물 원료공급망 구축을 위해 저장 및 가공시설 구축과 물류비 지원을 핵심 요소로 인식하는 것으로 조사되었다. 결론적으로 부산물은 원료 및 공정에 따라 발생 특성이 상이하였으며, 원활한 원료 공급망 구축을 위해서는 발생특성 뿐만 아니라 인프라 구축을 위한 노력 또한 중요할 것으로 보인다.

P2-26

Agar-pectin microcarrier systems for hydrophobic compound delivery and cultured meat applications

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Cultured meat has attracted significant attention as a sustainable alternative to conventional meat, driven by increasing global protein demand and environmental concerns. However, conventional 2D culture systems suffer from limited surface area, resulting in low cell proliferation efficiency. To overcome these limitations, 3D scaffolds have been introduced, and microcarrier-based systems are considered effective due to their high specific surface area and structural uniformity. In this study, edible microcarrier beads were successfully fabricated using plant-derived polysaccharides, specifically agar and low methoxyl pectin. Notably, the microbeads were formed via a surfactant-free Pickering emulsion method without utilizing chemical emulsifiers, with sizes ranging from 100 to 300 μl. Their physicochemical properties were analyzed to confirm stable structural characteristics. Furthermore, cell compatibility was evaluated using a resazurin assay, confirming excellent cell viability and robust metabolic activity. This study demonstrates the great potential of plant-based microcarriers and suggests their versatile applicability for encapsulation and delivery of hydrophobic compounds.

P2-27

A machine learning approach using ultrasonic sensors to monitor plant-based milk residue cleaning

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While the expanding plant-based milk market demands optimized Clean-in-Place (CIP) operations, the lack of intelligent, real-time monitoring results in resource-intensive, over-designed protocols. We propose a machine learning-driven approach utilizing non-destructive ultrasonic sensing to evaluate the cleaning efficacy of plant-based milk (soy and oat) residues. A comprehensive dataset was generated from laboratory-scale CIP experiments on stainless-steel surfaces cleaned with NaOH solutions. Ultrasonic waveforms were continuously acquired and synchronized with ground-truth measurements—including gravimetric analysis, electrical conductivity, and turbidity—to accurately label stages of surface cleanliness and effluent quality. This study focuses on developing a robust machine learning classification model by extracting and analyzing acoustic features from the time-series waveforms. By optimizing feature selection and algorithm performance, the model is designed to accurately categorize cleaning phases and autonomously predict the transition from fouled to cleaned states. This data-driven predictive system offers a reliable decision-support tool for CIP optimization, significantly reducing water and chemical consumption while ensuring food safety.

P2-28

Ingredient-specific taste modulation in formulated sauces evaluated by physicochemical and electronic tongue analyses

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This study investigated ingredient-specific taste modulation in formulated sauces using physicochemical and electronic tongue analyses. Sauce samples were prepared by increasing the formulation ratio of vinegar (VI), soy sauce (SO), *gochujang* (GO), salt (SA), starch syrup (ST), sugar (SU), or dashida (DA). Vinegar enhanced sourness-related attributes by lowering pH from 5.16 to 4.99 and increasing total acidity from 1.97 to 2.39%, peaking at VI1.5 (1.36). SA increased salinity from 6.30 to 8.43% and saltiness from 1.12 to 1.39; however, umami decreased at SA3.5 (0.95), suggesting umami-response suppression at excessive salt levels. Soy sauce and gochujang increased saltiness values to 1.46 and 1.62, respectively, despite only minor changes in salinity, while umami decreased to 0.48 (SO4) and 0.43 (GO16). Dashida enhanced umami, reaching 1.84 at DA6, but also increased saltiness to 1.61-1.84. In contrast, ST reduced saltiness to 0.48-0.63 and showed the highest umami value at ST14 (1.85), under relatively low salinity (5.60%) and NaCl content (8.26%). These findings show that each ingredient selectively modulates taste indicators and can guide formulation strategies for sourness enhancement, saltiness reinforcement, umami enhancement, and low-salt umami improvement.

P2-29

Investigation of suitable extraction processes, protein extraction efficiency, and essential amino acid content for the utilization of proteins from four types of seaweed

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This study was conducted due to the need for nutritional supplementation using seaweed protein to address the amino acid imbalance issues associated with single proteins, in response to the continuous expansion of the plant-based protein market. Additionally, to develop alternative meat by mixing plant-based protein sources, changes in essential amino acid composition were examined when isolated soy protein (ISP) was mixed with seaweed proteins (Kim, Maesaengi, Parae, and Tot). The study was performed to evaluate the potential of these materials as complex plant-based protein ingredients. Protein mixing ratios of soy protein and seaweed protein were set at 5:5 and 7:3, and the essential amino acid ratios of soy, Kim, Maesaengi, Parae, and Tot were measured against the ratios of soy protein and seaweed protein at 5:5 and 7:3. Through this, the feasibility of designing complex proteins was evaluated.

P2-30

Extraction and characterization of proteins from *Porphyra*, *Capsosiphon*, *Ulva*, and *Hizikia* using alkaline extraction and isoelectric precipitation

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Seaweed is a sustainable future protein resource, and seaweed protein has excellent essential amino acid content. Furthermore, with the continuous expansion of the plant-based alternative protein industry, there is a need for high-value utilization technologies for domestic seaweed. This study was conducted to extract proteins from *Porphyra yezoensis*, *Capsosiphon fulvescens*, *Ulva* spp., and *Hizikia fusiformis*, and to evaluate their extraction characteristics and amino acid composition. The seaweeds were dried and ground to 100 mesh, and lipids and fat-soluble components were removed using 70% ethanol (*Porphyra yezoensis* : 78.4±2.1%, *Capsosiphon fulvescens* : 75.2±1.8%, *Ulva* spp. : 73.6±1.9%, *Hizikia fusiformis* : 70.4±2.3%). Subsequently, proteins were recovered through alkaline extraction (pH 11.0) and isoelectric point precipitation (pH 3.8). Gim and Maesaengi showed relatively high protein recovery rates (Gim: 72.5±1.2%, Maesaengi: 69.8±1.1%), and all seaweed proteins showed excellent essential amino acid composition (Gim: 38.5, Maesaengi: 37.2, Parae: 40.0, Tot: 38.5 g/100 g protein).

P2-31

수확시기 및 냉침시간에 따른 보성 홍차의 품질특성 변화

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본 연구는 전라남도 보성군에서 수확하여 제조한 홍차의 냉침 특성 변화를 규명하기 위해 수확시기(우전, 곡우, 중작, 대작) 및 냉침시간(8, 16, 24시간)으로 구분하여 분석하였다. 각 시료는 홍차대비 10배수의 정제수로 냉침 추출하였으며, 추출액의 티폴리페놀 함량, 총아미노산 함량, 전자코, 전자혀를 분석해 비교하였다. 분석 결과, 침출 시간이 증가함에 따라 대부분의 시료에서 티폴리페놀과 총아미노산 함량이 증가하는 경향을 보였으나 수확시기에 따라 그 변화 양상에는 차이가 나타났다. 4월에 수확되는 우전과 곡우는 티폴리페놀 함량이 높았으며, 우전은 아미노산 함량 또한 가장 높게 나타났다. 전자코 분석결과, 냉침시간에 따른 군집 분리가 비교적 뚜렷하게 나타났다. 전자혀 분석결과, 우전과 곡우는 16시간 냉침 이후 패턴이 비교적 안정되었으나, 중작은 24시간에서, 대작은 모든 시간대에서 패턴이 크게 변하였다. 본 연구 결과는 수확 시기별 홍차의 냉침 적합성을 평가하고 최적의 냉침 조건을 설정하기 위한 기초자료로 활용될 수 있을 것으로 판단된다.

P2-32

Effects of enzymatic and glycosylation treatments on the structural and functional properties of beef scraps

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Adequate intake of high-quality protein is essential for maintaining bone health and muscle mass in elderly. However, protein sources in senior-friendly foods are often costly, highlighting need to upcycle and enhance the value of by-products. Processing technologies like enzymatic treatment and glycosylation can enhance protein quality by structural modifications. This study evaluated effects of enzymatic and glycosylation treatments on beef scraps, assessing changes in protein structure and function. Enzymatic treatment with bromelain and glycosylation using D-xylose were applied to prepare samples treated with enzymatic, glycosylation, and combined treatments. Hydrolysis degree was highest in enzymatic treatment. Protein solubility and surface hydrophobicity were greater in combined treatment. Both treatments altered the protein's secondary and tertiary structures. Glycosylation raised the grafting degree and browning index, with these effects further accelerated by combined treatment. Protein digestibility significantly improved with enzymatic treatment and remained high after combined treatment. These results indicate that beef scraps subjected to combined enzymatic and glycosylation treatments have potential as promising ingredients for developing senior-friendly foods.

P2-33

흰점박이꽃무지(*Protaetia brevitarsis*) 유충 열수추출물의 항당뇨 활성 및 유리아미노산 조성

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본 연구는 흰점박이꽃무지 유충 열수추출물의 제조조건에 따른 품특성과 항당뇨 활성 및 유리아미노산 조성을 분석하여 식품 소재로서의 활용 가능성을 평가하고자 하였다. 열수추출물은 추출비율(5, 10, 15, 20배)과 추출시간(1-8시간)을 달리하여 제조하였으며, °Brix, pH, 색도, α-glucosidase 저해활성 및 유리아미노산을 분석하였다. 추출비율이 낮을수록 Brix가 높게 나타났으며, pH는 처리구 간 큰 차이를 보이지 않았다. 추출비율이 증가할수록 명도는 증가하고 적색도와 황색도는 감소하였다. α-Glucosidase 저해활성은 추출시간 증가에 따라 향상되는 경향을 나타내어 혈당 상승 억제 가능성을 확인하였다. 유리아미노산 분석 결과 프롤린 함량이 약 50%로 가장 높았으며, 글루탐산, 알라닌 및 아르기닌이 주요 아미노산으로 확인되었다. 이상의 결과로 흰점박이꽃무지 유충 열수추출물은 α-glucosidase 저해활성과 다양한 유리아미노산을 함유하고 있어 기능성 식품 소재로서의 활용 가능성을 확인하였다.

P2-34

치즈 부산물 유청 첨가 비율에 따른 한식 된장의 품질 특성

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유청이란 치즈제조 과정 중 생산되는 부산물을 말하며, 치즈 제조시 치즈 생산량의 10배 정도가 생산되는 것으로 알려져 있다. 국내 유청의 활용은 일부를 분말로 가공하지만 생산된 유청의 양이 적고 이용할수 있는 기반 시설이 미비하여 수입산 유청보다 활용이 저조하다. 유청에는 단백질, 미네랄, 아미노산, 젖산 및 효소 등이 포함되어 있고 우수한 유화작용, 거품생성, 기포형성, 젤라틴화 및 용해성 등 여러 기능적인 특성으로 이용가치가 높게 평가된다. 따라서 유청을 활용하여 제조된 된장은 맛과 향이 증진될 것으로 판단된다. 된장의 제조는 대조구의 경우 메주 1,250 g, 소금 1,000 g 및 정제수 4,000 g 을 혼합하였다. 유청을 활용한 시료구는 메주 1,250 g과 소금 1,000 g을 대조구와 동일하게 첨가 하였으며 정제수를 대신해 유청을 25, 50 및 75% 첨가하여 제조하였다. 제조된 유청 된장의 항산화 실험을 통해 총 폴리페놀 함량은 75% 시료구에서 2.13±0.02 mg GAE/g, ABTS 라디칼 소거능은 유청 75% 처리구에서 72.97±1.04% 가장 높은 값으로 측정 되었다. 이는 유청 단백질 유래 생리활성 물질과 된장 발효 대사산물의 상호작용에 의한 결과로 판단된다. 이후 제조된 된장과 된장을 첨가하여 끓인 된장국의 관능평가를 진행하였다. 그 결과, 유청 75% 첨가구가 모든 항목에서 우수성을 나타내었다. 된장국에서는 감칠맛과 뒷맛이 대조구 및 타 처리구와 비교하였을때 가장 높은 기호도를 보였고, 전체적인 기호도 측면에서 75% 첨가구가 대조구 대비 가장 높은 선호도를 나타내었다. 따라서 유청함유량 75% 배합비에서 전통적인 된장 풍미의 정체성을 유지하면서 유청의 기능적 장점이 조화로울 것으로 판단된다.

P2-35

돌배박 유래 석세포의 추출공정에 따른 효율성 평가 및 개발

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돌배란 산돌배(*Pyrus ussuriensis* Maxim.)의 열매로 떫고 신맛이 강하며 단단한 섬유질인 석세포가 많아 생과로 섭취하기 어려워 착즙이나 가공을 통해 판매되고 있다. 이중 착즙 후 대부분 폐기되는 박에는 리그닌, 셀룰로오스, 헤미셀룰로오스 등으로 구성된 석세포가 포함되어 있으며, 미세플라스틱 대체 천연소재로 활용 가능성을 주목받고 있다. 이러한 석세포의 추출은 산·알칼리처리를 통해 이루어지고 있어 소규모 업체에서는 적용하기 어려운 실정이다. 따라서 본 연구는 돌배박 유래 석세포의 효율적 추출 공정을 개발하고자 공정을 비교평가 하였다. 돌배박은 분쇄후 추출과 건조분쇄후 추출로 구분하였으며, 각 시료에 초음파, 열수 및 산알칼리 추출공정을 적용하였다. 각 공정은 다음과 같다. 초음파 추출은 초음파기기에 30분간 추출 후 상등액을 제거하는 과정을 15회 반복하여 잔여물을 회수하였다. 열수추출은 끓는 물에서 1시간 동안 가열한 뒤 상등액 제거 과정을 15회 반복하고 잔여물을 회수하였다. 산알칼리 추출은 1.25% 황산과 1.25% NaOH를 순차적으로 처리한 다음 잔여물을 회수하였다. 모든 시료군에서 분쇄후 추출 시료군에 비해 건조분쇄후 추출 시료군이 각각 23.31%, 16.02%, 10.24%의 높은 회수율을 보였다. 공정에 따른 회수율의 경우 초음파 추출이 산알칼리추출보다 높은 추출효율을 나타내었다. 공정에 따른 회수율에서 초음파 공정이 우수한 것으로 나타났으나, 순도는 산·알칼리 공정에 비해 낮은 것으로 나타났다. 향후 이러한 순도를 개선하는 연구를 실시하고자 한다.

P2-36

Effects of propylene glycol alginate on the quality characteristics of gluten-free rice noodles

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This study investigated the effects of propylene glycol alginate (PGA) on the quality characteristics of gluten-free rice noodles. Gluten-free rice noodles were prepared with four PGA levels (0.10, 0.125, 0.175, and 0.225 g/100 g rice flour) and evaluated for cooking properties, color, texture profile analysis (TPA), sensory acceptability, and microstructure. As the PGA level increased, the volume expansion of cooked noodles increased from 207.5% to 309.0%. In addition, the lightness (L*) of uncooked noodles increased from 74.98 to 77.77, while cooking loss remained low (1.40 – 1.55%) regardless of PGA concentration. TPA results showed that hardness decreased from 569.75 to 311.33 g and chewiness decreased from 2.59 to 1.02 mJ with increasing PGA levels, indicating the formation of a softer noodle texture. Sensory evaluation revealed that noodles containing intermediate PGA levels (0.125 and 0.175 g/100 g rice flour) achieved the highest overall acceptability scores (6.94), whereas formulations with the lowest (0.10 g/100 g) and highest (0.225 g/100 g) PGA levels received lower scores. Scanning electron microscopy showed that increasing PGA concentrations resulted in a more uniform and porous internal structure. These findings suggest that an optimal PGA level of 0.125 – 0.175 g per 100 g rice flour can effectively enhance the cooking performance, texture, and consumer acceptability of gluten-free rice noodles.

P2-37

토란 줄기의 가공 전처리에 따른 아린 맛 성분 및 주요성분 변화

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토란(*Colocasia esculenta*)은 칼륨 함량이 높아 혈압 조절의 효능이 있다고 알려져 있다. 줄기는 알토란 보다 칼륨 함량이 약 2배 높으나 아린 맛의 원인인 옥살산 함량이 약 2.7배 정도 높아 활용에 제약이 있다. 본 연구에서는 토란 줄기의 활용도 증진을 위해 아린 맛을 줄일 수 있는 전처리 조건을 검토하였다. 줄기에 함유된 옥살산의 대부분은 수용성 옥살산으로 침지와 삶기 처리를 수행하였다. 생 토란 줄기는 1% 소금물에 5, 15, 25시간 침지 및 침지 후 5 또는 10분 삶았으며, 건 토란 줄기는 1% 소금수 또는 소다수 침지 및 삶기 단일 처리와 침지-삶기, 삶기-침지의 복합 처리를 하였다. 그 결과, 생 토란 줄기는 5시간 침지 후 10분 삶기 처리 시 옥살산 함량이 원물 대비 24% 감소하였고, 항고혈압 효능은 58%, 칼륨 함량은 72% 유지되었다. 건 토란 줄기는 단일 처리보다 복합 처리에서 효과가 우수하였으며, 10분 삶은 후 1% 소다수(초기온도 100℃)에 15시간 침지한 처리구에서 옥살산 함량이 59% 감소하고 항고혈압 효능은 89%, 칼륨 함량은 89% 유지할 수 있었다. 따라서 건 토란 줄기의 삶기와 소다수 침지를 병행한 복합 처리가 기능성 유지와 아린 맛 저감에 효과적인 전처리 방법으로 판단된다.

P2-38

Influence of MCT-canola oil ratio on the encapsulation and freeze-thaw stability of *Leuconostoc mesenteroides* in o/w emulsions

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Maintaining the viability of lactic acid bacteria during food processing and storage remains a major challenge in emulsion-based microbial delivery systems. This study investigated the effects of the MCT-to canola oil ratios on the physicochemical properties and encapsulation performance of O/W emulsions containing *Leuconostoc mesenteroides*. Emulsions were prepared with MCT-to-canola oil ratios of 20:80, 30:70, and 40:60. Droplet size ranged from 105.93 to 175.31 μm and tended to be lower in formulations containing MCT than in those with higher proportions of canola oil. All emulsions exhibited zeta potential values above 30 mV, indicating sufficient electrostatic stabilization. Encapsulation efficiency remained high (78.8-84.0%), and viable cell counts exceeded 8.5 log CFU/mL after encapsulation. Following freeze-thaw treatment, viable cell counts remained above 7.4 log CFU/mL in all formulations. The MCT (20:80) formulation retained the highest viability (8.10 log CFU/mL), whereas the canola oil (40:60) formulation exhibited the lowest viability (7.40 log CFU/mL). The improved freeze-thaw stability observed in MCT-containing formulations was associated with reduced droplet size and enhanced encapsulation performance, suggesting greater protection against freezing-induced stress.

P2-39

무즙의 가공방법에 따른 이소시오시아네이트류 프로파일 변화

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무에 풍부하게 함유된 식이황화합물은 내재된 효소인 미로시네이스에 의해 이소시오시아네이트(isothiocyanate, ITC)로 전환되며, 특유의 매운 향과 다양한 생리활성과 관련이 있는 것으로 알려져 있다. 본 연구에서는 GC×GC-TOFMS를 이용하여 무즙의 가공방법에 따른 주요 ITC 성분 변화를 분석하고 PLS-DA 군집분석을 수행하였다. 무즙은 세척, 절단 후 마쇄·압착(FV) 또는 증자·압착(SV) 또는 열풍건조·열수추출(DV) 처리하여 제조하였다. ITC 계열 성분의 상대함량 총합은 SV (48±1.47)가 가장 높았으며, FV (33±1.00), DV (23±1.20) 순으로 나타났다. PLS-DA 분석 결과 처리조건에 따라 세 그룹이 명확히 분리되었으며, trans-raphasatin (VIP=1.61)과 cis-raphasatin (VIP=1.46)이 SV 그룹의 변별력을 결정하는 주요 성분으로 확인되었다. 따라서 증자 처리는 raphasatin 계열 ITC 함량을 효과적으로 증가시키는 가공기술로 판단되며, 기능성 식품 및 메디푸드 소재 개발에 활용 가능성이 있을 것으로 사료된다.

P2-40

Production of functional food ingredients from sword bean-based *Cordyceps militaris* fermentation

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Cordyceps militaris is a medicinal mushroom known for producing various bioactive compounds, including cordycepin, adenosine, and ergosterol. This study investigated the effects of plant-based cultivation media containing sword bean (*Canavalia gladiata*) and brown rice on bioactive compound accumulation and anti-inflammatory activity of *C. militaris* fermented products. *C. militaris* was cultivated on media prepared with different mixing ratios of sword bean and brown rice. The fermented products were analyzed for cordycepin, adenosine, and ergosterol contents. Anti-inflammatory activity was evaluated in lipopolysaccharide (LPS)-stimulated RAW 264.7 macrophages by measuring nitric oxide (NO) production and pro-inflammatory cytokine secretion. Among the tested formulations, the medium containing 60% sword bean and 40% brown rice showed the highest levels of cordycepin, adenosine, and ergosterol. In addition, extracts from this fermented product significantly inhibited LPS-induced NO production and reduced pro-inflammatory cytokine secretion compared with other treatment groups. These results indicate that optimization of plant-based cultivation media can enhance the accumulation of bioactive compounds and improve the anti-inflammatory activity of *C. militaris* fermented products. Sword bean-based cultivation may therefore provide an effective strategy for developing value-added functional food ingredients enriched with bioactive compounds and health-promoting properties.

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P2-41

반응표면분석법을 이용한 배박 건조물 유래 알부틴의 추출조건 최적화

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배즙 및 음료 제조 후 발생하는 배박은 연간 수천 톤 규모로 발생하며, 과피와 과심 등 비가식부를 다량 포함하여 기능성 소재로서 활용 가치가 높다. 본 연구에서는 반응표면분석법(Response Surface Methodology, RSM)을 이용하여 배박 건조물에 잔류한 알부틴의 최적 추출조건을 구명하고자 하였다. 배박은 열수침지 후 열풍건조 및 조분쇄하여 사용하였으며, pH 조정제(1 M 구연산 또는 1 M Tris 용액 0.5, 1%), 추출시간(1–20 h) 및 추출온도(50–90℃)를 변수로 설정하여 총 38조건에서 열수추출을 수행하였다. 분산분석 결과 pH 조정제와 추출시간이 알부틴 함량에 유의한 영향을 미쳤으며, 약산성 조건(pH 4.0–4.5, 구연산 0.5%)에서 높은 함량을 나타냈다. 모델 예측 결과 알부틴 함량은 12시간 이상의 장시간 및 고온 추출 조건에서 증가하는 경향을 보였으며, 알부틴 최대화와 하이드로퀴논 최소화를 고려한 최적 조건은 구연산 0.5% 첨가, 77.4℃, 20 h로 도출되었다. 이 조건에서 알부틴 및 하이드로퀴논 함량은 각각 270.4 및 6.1 mg/100 g으로 예측되었다. 본 연구결과를 실제 공정에 적용한 후속 검증연구가 필요하며, 업사이클링 화장품 소재로서 배박 추출물의 활용 가능성이 기대된다.

P2-42

Effects of different cooking methods on the physicochemical, textural, and volatile flavor characteristics of Tteokgalbi

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This study investigated the effects of four cooking methods on the quality characteristics of Tteokgalbi: convection oven (180℃, 15 min, T1), steam oven (180℃, 50% steam, 15 min, T2), pan frying (180℃, 5 min, T3), and superheated steam (230℃, 15 min, T4). pH, color, proximate composition, texture profile analysis, cooking loss, diameter reduction, water holding capacity (WHC), and volatile flavor compounds were evaluated. Cooking methods significantly affected all measured parameters ($p<0.05$). Convection oven showed the highest pH but lowest cooking loss, diameter reduction, and WHC. Steam oven and superheated steam showed higher cooking loss, protein and ash contents, and greater hardness, cohesiveness, gumminess, and chewiness, indicating a denser protein gel network. Superheated steam showed WHC comparable to pan frying despite high cooking loss. Among 31 volatile compounds, 29 differed significantly: garlic-derived sulfur compounds were highest in steam oven, terpenes were highest in pan frying, and Strecker products were highest in superheated steam. These results show that cooking method strongly influences the physicochemical, textural, and flavor properties of Tteokgalbi, providing useful information for selecting cooking processes for desired product characteristics.

P2-43

국내·외 품종별 홍화잎의 유용성분 특성

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홍화(Safflower, *Carthamus tinctorius* L.)는 잎과 종자가 식품 원료로 등록되어 있지만 주로 홍화씨만 식품에 사용하고 있으며, 식물체의 대부분을 차지하는 잎과 줄기는 활용도가 낮아 부산물로 폐기되고 있다. 최근 홍화잎에 함유된 생리활성 물질이 골질환 개선 및 예방 효과를 나타내는 것으로 보고되면서 식품 소재로서의 활용 가능성이 주목받고 있다. 본 연구에서는 국내·외 홍화 11품종의 잎을 대상으로 유용성분 함량과 항산화 활성을 비교하였다. 파골세포 분화 및 골 흡수 억제와 관련된 quercetin 및 luteolin 유도체 5종의 총 함량은 청수 품종에서 13.3 mg/g으로 가장 높았다. 강한 항산화 및 항염 활성이 알려진 4,5-dicaffeoylquinic acid 함량은 의산 품종 4.9 mg/g과 전남 해남 재래종 4.3 mg/g에서 높게 나타났다. 총 페놀성 화합물 함량과 ABTS 라디칼 소거능은 의산 품종에서 각각 16.6 mg/g 및 36.7 mg/g Vit. C eq.로 가장 우수하였다. 또한 국내 품종 6종은 미국·중국 등 국외 품종 5종에 비해 유용성분 함량이 전반적으로 높은 경향을 보였다. 이상의 결과는 국내 홍화잎이 기능성 식품 소재로 활용될 가능성이 높음을 시사한다.

P2-44

Quality characteristics and antioxidant effects of Yanggaeng (sweet red bean jelly) supplemented with *Pyropia yezoensis*

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This study aimed to develop a senior-friendly food with enhanced immunity and bioactivity by incorporating *Pyropia yezoensis* (laver), a red alga rich in protein, dietary fiber, minerals, and polyphenols. Yanggaeng was prepared using agar, sugar, honey, oligosaccharide, cooked white bean paste, and varying concentrations (0, 0.5, 1.0, 1.5, 2.0, and 2.5%) of *P. yezoensis* powder, and its physicochemical, antioxidant, and sensory properties were evaluated. The moisture content showed no significant change across all groups. In contrast, pH and sugar content decreased with higher powder concentrations. Color analysis revealed a significant decrease in lightness (L*), whereas redness (a*) and yellowness (b*) increased with increasing *P. yezoensis* content. In texture profile analysis (TPA), hardness, gumminess, chewiness, and cohesiveness consistently declined. Notably, the antioxidant activity of Yanggaeng was significantly enhanced in a concentration-dependent manner. In the sensory evaluation, the formula with 2.5% powder achieved the highest overall acceptance score. Consequently, these findings suggest that adding *P. yezoensis* powder effectively improves the quality and antioxidant functionality of Yanggaeng.

P2-45

품종 및 수확시기별 고구마 잎·줄기의 기능적 특성

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고구마(*Ipomoea batatas*)는 전라남도가 전국 최대 생산지인 소득 작물로, 덩이뿌리뿐만 아니라 잎과 줄기 또한 식품 원료로 활용 가능하다. 그러나 고구마 잎·줄기는 일부만 식용으로 이용되고 대부분 폐기되어 활용성 증대가 요구된다. 본 연구에서는 2025년 국내 주요 재배품종의 고구마 잎·줄기에 함유된 기능성 성분과 생리활성을 비교하고, 수확시기에 따른 변화를 조사하였다. 클로로젠산 및 이소클로로젠산 3종의 총 함량은 진율미 23.6 〉 호풍미 21.5 〉 베니하루카 20.5 〉 단자미 18.5 〉 소담미 17.1 mg/g 순으로 높았으며, 총 페놀성화합물 함량도 진율미에서 가장 높게 나타났다(9.4 mg/g). COX-2 활성 억제효과는 베니하루카에서, tyrosinase 활성 억제효과는 소담미에서 가장 우수하였다. 또한 베니하루카 잎·줄기를 7-10월 수확 시기별로 비교한 결과, 클로로젠산류 함량, 총 페놀성 화합물 함량 및 항산화 활성은 9 〉 10 〉 8 〉 7월 순으로 높았으며, tyrosinase 활성 억제효과 역시 9월 수확 시료에서 가장 우수하였다. 따라서 고구마 잎·줄기는 기능성 소재로서 활용 가능성이 높으며, 품종 및 수확시기에 따라 기능성 성분과 생리활성이 크게 달라지는 것으로 확인되었다.

P2-46

Inhibition of browning in low-salt sea squirt (*Halocynthia roretzi*) Jeotgal using pH-adjusted washing water

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This study was conducted to inhibit browning and improve the shelf life of low-salt sea squirt (*Halocynthia roretzi*) jeotgal. Sea squirts were washed with pH-adjusted washing water, dehydrated, and cutting into appropriate sizes. The *jeotgal* was prepared by adding 2% salt and 0.5% monosodium glutamate (MSG) relative to sea squirt weight. An oxygen scavenger and sealing film were applied at packaging to suppress browning. Samples were stored at 4 and 10℃ for 56 days, during which pH, color, total viable count, and volatile basic nitrogen (VBN) were periodically measured. Tyrosinase and polyphenol oxidase, the primary enzymes responsible for browning, exhibited the highest inhibitory efficiency at pH 3, leading to the selection of pH 3 as the washing water condition. The pH 3-treated samples maintained VBN levels of 11.51±1.59 mg/100 g throughout the 56-days at 4℃, whereas the control group reached 46.82±0.80 mg/100g by day 21. Both L* and b* values of the pH 3-treated samples remained stable under 4 and 10℃ storage, indicating effective color preservation. These findings demonstrate that pre-treatment with pH 3 washing water is more effective in inhibiting browning and enhancing the shelf life of low-salt sea squirt jeotgal compared to conventional freshwater washing.

P2-47

국산 장립종 쌀 품종(IPS) 이용 국수의 품질특성

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쌀국수는 밀가루를 대체할 수 있는 대표적인 쌀 가공식품으로 원료 쌀가루의 품질 특성이 최종 제품의 품질에 큰 영향을 미친다. 본 연구에서는 국산 장립종 쌀 품종(IPS)과 시판 쌀국수 제조용 쌀가루 2종의 이화학특성을 비교하였으며, IPS와 시판 쌀가루의 배합을 달리하여 제조한 쌀국수의 품질 특성을 조사하였다. IPS 쌀가루는 조지방 0.42%, 회분 0.69%, 아밀로스 22.34%, 총전분 81.19%로 시판 쌀가루보다 높은 함량을 나타냈으며, 총당 함량은 상대적으로 낮았다. 색도에서는 IPS가 상대적으로 명도(L*)는 낮고 황색도(b*)는 높았다. 제조된 쌀국수의 품질 특성 조사 결과, 수분활성도와 수분함량은 IPS100%로 제조한 쌀국수가 가장 낮았으며, 부피증가율은 103.8–104.3%로 큰 차이를 보이지 않았다. 색도는 복원 전에 IPS 처리구가 시판 쌀가루 이용 쌀국수보다 명도가 낮아 어두웠으나 복원 후에는 높은 값을 보여 밝은 면 색을 유지하는 것으로 나타났다. 관능평가 결과 IPS50%+시판a50% 비율의 쌀국수가 맛, 씹힘성, 전체적 기호도에서 가장 높은 값을 보였다. 따라서 IPS 쌀가루는 쌀국수 제조용으로 활용 가능성이 높으며, IPS 50%+시판a50% 쌀국수가 품질 및 기호도 향상에 가장 효과적인 배합으로 판단되었다.

P2-48

Hyperspectral assessment of wheat dough development during mixing

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This study was designed to evaluate wheat dough development as affected by flour strength and mixing time using hyperspectral imaging (HSI) for non-destructive monitoring by correlating stress relaxation analysis (SR) and low-field nuclear magnetic resonance (LF-NMR) parameters. Doughs from hard, all-purpose, and weak flours were mixed for 2, 6, 12, 18, and 22 min. SR results showed clear flour-strength dependence: F∞, F1, F2, τ1, and τ2 were highest in hard-flour dough and lowest in weak-flour dough, indicating a stronger viscoelastic gluten network. LF-NMR resolved two water populations, with τ2,1 of 3.26-3.95 ms and τ2,2 of 11.95-16.51 ms. VIS-NIR spectra increased toward longer wavelengths and varied by flour type and mixing time, whereas SWIR spectra showed water-related absorption near 1450 nm. Multivariate models separated flour types and mixing stages and predicted SR/LF-NMR parameters. Prediction was strong for mixing time (R2 ≈ 0.90-0.94), while SR positive force/area parameters showed moderate to high correlations (R2 up to 0.90). Overall, HSI showed potential for rapid assessment of dough rheology and water mobility.

P2-49

Hyperspectral imaging for monitoring cold-induced sweetening and assessing storage-related quality changes in potatoes

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Cold storage is widely used in potato processing to extend shelf life and suppress sprouting, but low temperature induces cold-induced sweetening (CIS), which accumulates reducing sugars. This increases acrylamide formation during frying, creating a quality and safety issue for fried potato products. This study investigated hyperspectral imaging (HSI) for non-destructive discrimination of fresh and cold-stored potatoes at different processing stages. Potato tubers (cv. Superior) harvested in May from Gimje, Jeollabuk-do, Republic of Korea, were stored under low temperature and processed into raw, blanched, and par-fried samples. Hyperspectral images were acquired in the visible-near infrared (VIS-NIR) and short-wave infrared (SWIR) regions, and spectral data were analyzed using partial least squares discriminant analysis (PLS-DA). Results showed that storage history caused distinct spectral differences, and both VIS-NIR and SWIR enabled non-destructive discrimination of potatoes according to storage condition across processing stages. These findings suggest that HSI can be a rapid tool for monitoring CIS-related quality changes and acrylamide risk in potato processing.

P2-50

Modification of kale pomace fibers via alkaline hydrogen peroxide pretreatments combined with high-speed homogenization: Structural, physicochemical, functional, and emulsifying properties

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This study aimed to modify kale pomace fibers (KPFs) using alkaline hydrogen peroxide (AHP) pretreatment combined with high-speed homogenization (HSH) and to evaluate their potential as Pickering emulsion stabilizers. Fourier transform infrared spectroscopy revealed a reduction in lignin- and hemicellulose-associated absorption peaks and an increase in cellulose-related signals, indicating substantial changes in the chemical composition of the KPFs. Compared with untreated KPFs, the modified KPFs (MKPF-3) exhibited higher crystallinity (47.68%), whiteness index (89.24%), dispersion stability (-39.76 mV), and thermal stability (335.83℃). In addition, the functional properties of MKPF-3 were significantly ($p < 0.05$) greater than those of untreated KPFs. These structural and physicochemical modifications markedly enhanced the emulsifying performance of the fibers, with the emulsifying activity index increasing from 3.48 to 31.26 m^2/g and the emulsion stability index increasing from 71.31% to 99.51%. These results demonstrate that the combination of AHP pretreatment and HSH is an effective strategy for modifying the structural characteristics and functionality of KPFs, thereby enhancing their potential as natural Pickering emulsion stabilizers for food applications.

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P2-51

D-Tagatose enhances Maillard browning and sensory quality of enzyme-mediated sucrose-free white pan bread

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This study evaluated D-tagatose as a sugar alternative to improve the quality of enzyme-mediated sucrose-free white pan bread. A sucrose-free formulation containing transglucosidase and maltotetraose-producing amylase was used to maintain proofing performance, loaf volume, and crumb softness without added sucrose. D-tagatose was incorporated at different levels to compensate for the limited sweetness, weak crust browning, and reduced Maillard-derived aroma of enzyme-treated sucrose-free bread. The enzyme-treated bread showed proofing time and specific volume comparable to those of sucrose-added bread. D-tagatose addition progressively decreased crust L* values and increased a* values and browning intensity. Moderate D-tagatose levels, especially 2–4%, improved sweetness, caramel-like aroma, and overall acceptability while maintaining acceptable texture during storage. HPLC analysis showed that glucose, sucrose, and maltose remained low, whereas residual D-tagatose contributed to sweetness. These results suggest that combining transglucosidase, maltotetraose-producing amylase, and D-tagatose is a practical strategy for producing high-quality sucrose-free bread.

P2-52

Improving the rheological properties and printability of high-protein starch-protein food inks using iota-carrageenan

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Food 3D printing enables the production of personalized foods with tailored nutritional compositions. However, increasing protein content while reducing starch often decreases the printability of food inks because proteins form weaker network structures than starch-based systems. This study investigated the effect of iota-carrageenan on the rheological properties and printability of high-protein starch-protein food inks. Food inks were prepared with different starch-to-protein ratios at a constant total solid content, and iota-carrageenan was added at various concentrations. Rheological properties were evaluated using storage modulus (G′), loss modulus (G″), and recovery ratio, while printability was assessed based on printing accuracy and structural stability after extrusion-based 3D printing. Increasing the protein proportion reduced viscoelasticity and printing stability, particularly when protein content exceeded 12 g in 30 g of total solids. The addition of iota-carrageenan improved the gel network structure, resulting in enhanced shape retention and layer stability. These findings suggest that iota-carrageenan is a promising hydrocolloid for developing high-protein food inks for 3D food printing applications.

P2-53

Evaluation of minimal processing characteristics and storage stability of fresh-cut produce

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The market for fresh-cut is expanding as single-person households increase and consumption diversifies. In this study, the safety distribution limit was reset by comparing the fruits and salad online distribution status and quality characteristics by mixing condition. Fresh-cut apple, orange, cherry tomato, and shine muskets were stored singly of in combinations. The flavor patterns by fruit items were showed a clear difference. The content of isoamyl acetate in apples, limonene and beta-phellandrene in oranges, 1-hexanol in cherry tomatoes, and methyl acetate and pentyl butanoate in shine muskets were high. As a result of investigating the packaging format of two types of salad products, product A was composed of three combinations of lettuce, romaine, and leaf beet, and product B was composed of four combinations of lettuce, cabbage, red cabbage, and chicory, and each was wrapped in 25 g PE film. Immediately after online distribution, a lot of condensation occurred due to temperature deviation. CO_2 was higher in product B compared to product A, and O_2 were significantly decreased in product A. Through the results, it is judged that fresh-cut will be helpful in improving the quality by identifying the change in flavor by mixing of fruits and selecting an effective combination for maintaining freshness.

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P2-54

Quality characteristics and antioxidant activity of soymilk fortified with *Peucedanum japonicum* Thunberg powder

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This study aims to evaluate the effects of adding *Peucedanum japonicum* Thunberg powder to soymilk on its quality characteristics and antioxidant activity. Soymilk containing *Peucedanum japonicum* Thunberg powder at 1, 3, and 5% was prepared. The physicochemical properties of soymilks including pH, titratable acidity, moisture content, color values (L*, a*, b*), transmittance (Y), and viscosity were analyzed. Antioxidant activities were assessed by DPPH and ABTS radical scavenging assays, ferric reducing antioxidant power (FRAP), total phenolic content (TPC), and total flavonoid content (TFC). With increasing powder content, pH and moisture content tended to decrease while viscosity increased; color shifted with higher a* and lower L*, b*, and Y values. Antioxidant activities (ABTS, TPC, TFC) also rose significantly as powder levels increased. Notably, 5% powder yielded about a twofold increase in DPPH radical scavenging activity and a 2.5-fold FRAP compared with control. These findings indicate that Peucedanum japonicum Thunberg powder enhances antioxidant activity of soymilk without substantially altering quality characteristics, suggesting potential as a functional ingredient for high-value food development. Further work may address sensory properties and storage stability.

P2-55

Deep learning enables evaluation of persimmon quality with your smartphone

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Recently, with growing interest in automated agricultural quality control, non-destructive analytical methods have been actively implemented in agri-food systems. Among these, smartphone imaging technology is highlighted for its high on-site applicability and cost-effectiveness. This study explored the feasibility of using smartphone imaging coupled with deep learning models to predict the brix, hardness, gumminess, chewiness, and antioxidant capacity of persimmons based on their ripening stages. The prediction results for each quality attribute revealed that convolutional neural network (CNN)-based models generally performed better in predicting chemical properties, such as brix (RMSE : 0.614) and antioxidant capacity (RMSE : 7.403). In contrast, transformer-based models exhibited superior performance in predicting mechanical properties, including hardness (RMSE : 1.384), gumminess (RMSE : 0.334), and chewiness (RMSE : 0.375). In conclusion, this study demonstrated that the optimal model architecture varies depending on the specific quality attribute. Furthermore, implementing a mixture of experts (MoE) approach that integrates these specialized models could effectively support the development of automated quality management systems for agricultural products.

P2-56

Quality characteristics and antioxidant activity of pound cakes with *Peucedanum japonicum* Thunberg powder

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This study investigated the quality characteristics and antioxidant activities of pound cakes containing *Peucedanum japonicum* Thunberg (*P. japonicum*, 3, 5, and 7%) or *Artemisia princeps* powder (5%). Butter was melted and mixed with sugar, oligosaccharide, and salted eggs, followed by the addition of flour, baking powder, and *P. japonicum* powder. Milk was added to form a batter, which was portioned into molds (70–80% capacity) and baked at 160℃ for 20 min. Batter viscosity showed no significant differences compared with the control. After baking, volume, weight, height, and moisture content were not significantly affected by either powder. Textural properties (cohesiveness, springiness, gumminess, and chewiness) and color values (L*, a*, and b*) of crust and crumb decreased with increasing *P. japonicum* powder content, whereas hardness was unaffected regardless of the amount added. The pound cakes with *P. japonicum* powder exhibited higher DPPH (85.75%), ABTS (92.06%), total polyphenol (41.7 μg GAE/mL), and total flavonoid contents (73.81 μg QE/mL) than the control. At 5%, *P. japonicum* also exhibited greater antioxidant activity than *A. princeps*. These results suggest that *P. japonicum* has strong potential as a natural antioxidant and functional food ingredient.

P2-57

Effects of *Peucedanum japonicum* Thunberg powder addition on the probiotic viability and quality characteristics of pudding

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This research evaluated the effects of incorporating different concentrations of *Peucedanum japonicum* Thunberg (*P. japonicum*) powder on probiotic viability and the quality characteristics of pudding during cold storage. Previous studies suggest that P. japonicum may have contributed to maintaining probiotic viability during storage. Milk was inoculated with Lactobacillus acidophilus (LA-5) at 0.15% and fermented to reach a pH of 5.25 ± 0.05. The fermented milk was subsequently blended with mixtures containing 3, 4, and 5% *P. japonicum* powder. Compared with the control, puddings containing the powder showed gradual decrease in hardness, cohesiveness, springiness, gumminess, and chewiness, whereas adhesiveness was significantly decreased. In color values, L* and a* values decreased, while the b* value increased with increasing powder addition content. Although *P. japonicum* powder did not significantly affect probiotic viability in this study, its effects on probiotic viability in pudding will be further evaluated during cold storage at weekly intervals to provide more detailed assessment.

P2-58

Machine learning-guided screening of bigel formulations as shortening alternatives

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Bigels are promising shortening alternatives, but their texture properties depend on complex interactions among oil type, gelator type and concentration, and oleogel–to–hydrogel ratio. Based on a literature review, three types each of oil, oleogelator, and hydrogelator were selected. Fifteen formulations were prepared for each of 27 ingredient combinations, varying gelator concentration and oleogel–to–hydrogel ratio, yielding 405 samples. Peak positive force, peak negative force, positive area, and negative area were used as multi–output texture targets, and solvent holding capacity (SHC) after centrifugation was measured for stability. Ridge and Random Forest regressors were developed in Python/scikit–learn and evaluated against a mean baseline using group cross–validation. Random Forest achieved the best, though moderate, performance (standardized profile MAE=0.465, RMSE=0.792, mean R^2 =0.373) and ranked untested formulations by predicted distance from shortening. The top candidate contained 40% GMS in the oleogel phase, 3% sodium alginate in the hydrogel phase, a 50:50 oleogel/hydrogel ratio, and sunflower oil. Seven untested candidates, with the closest existing formulation, were selected for independent TA/SHC validation to support iterative refinement and food application.

P2-59

Physicochemical and sensory properties of kefir supplemented with lactic acid bacteria derived from *makgeolli* and commercial strains

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This study evaluated the quality characteristics of kefir prepared using kefir grains supplemented with *makgeolli*-derived lactic acid bacteria (LAB) (M) and compared them with kefir supplemented with *Lactococcus lactis* subsp. lactis (LL), *Lactobacillus delbrueckii* subsp. *bulgaricus* (LB), and a commercial kefir starter culture (Com). The pH, viscosity, color, fat and moisture contents, total bacterial counts, and LAB counts were analyzed, and electronic nose (e-nose), electronic tongue (e-tongue), and sensory evaluations were performed. The M, LL, and LB samples showed significantly higher lightness, redness, viscosity, and fat contents than the Com sample ($p < 0.05$), while the LAB count was highest in M ($p < 0.05$). E-nose analysis indicated that M exhibited stronger buttery, creamy, cheesy, and fruity flavor characteristics than the other treatments. E-tongue analysis showed higher sourness and umami in M, LL, and LB samples. Sensory evaluation revealed significantly higher scores for most attributes in M ($p < 0.05$). These results suggest that *makgeolli*-derived LAB have potential as adjunct cultures for kefir production by improving microbial, sensory, and quality characteristics.

P2-60

Comparative study of aquafaba- and egg-based mayonnaise prepared with diverse vegetable oils

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This study aims to investigate the effects of vegetable oil types on the physicochemical, microstructural, and rheological properties of egg- and aquafaba-based mayonnaise to support the development of plant-based and egg-free alternatives. Mayonnaise samples were prepared using corn, canola, olive, and soybean oils. The physicochemical, structural, and rheological characteristics of the formulated mayonnaise samples were systematically evaluated. Emulsion stability ranged from 80.95% to 99.09% and was significantly affected by oil type ($p < 0.05$), with canola oil mayonnaise exhibiting the highest stability in both egg- and aquafaba-based formulations. All samples exhibited non-Newtonian shear-thinning behavior and were well described by the power law model ($R^2 = 0.9$). Egg-based mayonnaise showed significantly higher consistency index (K) values (13.77 – 23.91 $Pa \cdot s^n$) than aquafaba-based mayonnaise (8.82 – 10.08 $Pa \cdot s^n$), indicating greater resistance to flow ($p < 0.05$). These results indicate that the emulsion structure, rheological behavior, and stability of mayonnaise were affected by both vegetable oil type and emulsion source, providing useful information for the development of high-quality vegan mayonnaise products.

P2-61

Optimization of ultrasound-assisted extraction of *Zophobas morio* protein using artificial neural network genetic algorithm (ANN-GA) and its effects on structural and functional properties

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Edible insects have gained attention as low-carbon alternative protein sources due to their nutritional value and reduced environmental impact. Ultrasound-assisted extraction (UAE) offers advantages including high extraction efficiency, rapid processing, and simple operation; however, complex and non-linear interactions among extraction variables require process optimization. This study applied an artificial neural network-genetic algorithm (ANN-GA) to optimize UAE parameters for *Zophobas morio* protein (ZMP) extraction and compared its predictive performance with conventional response surface methodology (RSM). ANN-GA exhibited a higher R^2 value (0.97) and lower prediction error (0.85%) than RSM (R^2 = 0.95; error = 0.90%), demonstrating better UAE model optimization. ZMP obtained under optimized UAE conditions exhibited altered structural unfolding of ZMP and enhanced functional properties compared with alkaline-extracted protein, including improved protein solubility, emulsifying activity, and in vitro protein digestibility. These findings suggest that ANN-GA is an effective approach for UAE optimization and that optimized UAE treatment can improve the processing functionality of ZMP for food applications.

P2-62

Explainable deep learning for predicting weight loss and interpreting environmental drivers in stored onions

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Postharvest weight loss in onions occurs during storage and distribution due to transpiration, respiration, and decay, causing economic losses. This study applied Long Short-Term Memory (LSTM) and Temporal Fusion Transformer (TFT) models to predict the weight-loss rate of stored onions and interpreted the predictions using explainable artificial intelligence (XAI). Time-series data from different cultivars and storage environments, including temperature and humidity, were used for model development. Environmental contributions to prediction were analyzed using TFT attention weights and SHAP-based feature importance. The interpretation results were generally consistent with postharvest physiology, suggesting that the models captured meaningful patterns related to onion weight loss. However, dataset generalization was limited by differences in initial onion conditions depending on cultivar and collection period. Future work will expand the dataset and incorporate initial-state variables to improve robustness. This study demonstrates the potential of XAI-integrated deep learning for postharvest quality management and distribution optimization of onions.

PART 3 Food Chemistry and Analysis

P3-01

Sugar and sweetener analysis of cafe beverages in Daegu

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This study analyzed 120 cafe beverages sold in Daegu, including 100 sugar-sweetened beverages and 20 low- or zero-sugar beverages, for five sugars, three artificial sweeteners, two steviol glycosides and five sugar alcohols. Among the sugar-sweetened beverages, 70% exceeded the World Health Organization (WHO) recommended daily sugar intake of 50 g per 2,000 kcal. By beverage type, exceedance rates were 45% for lattes, 55% for fruit juices, 90% for iced teas, 75% for smoothies, and 85% for ades. In contrast, only one low- or zero-sugar beverage exceeded the recommended limit. Analysis of artificial sweeteners showed that sodium saccharin was detected in four sugar-sweetened beverages and aspartame in one. In low- or zero-sugar beverages, acesulfame potassium and aspartame were detected in a total of nine beverages. Sugar alcohols such as erythritol and maltitol were not detected in sugar-sweetened beverages, whereas xylitol, sorbitol, and mannitol were present in small amounts. In low- or zero-sugar beverages, erythritol, xylitol, sorbitol, and mannitol were detected, whereas maltitol was absent in all samples. These results indicate that sugar alcohols are commonly used as alternative sweeteners in low- or zero-sugar beverages.

P3-02

Deriva-LM: Scaffold-constrained chemical language modeling for synthetically plausible natural product analogue generation

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Natural products (NPs) remain a privileged source of chemical matter for drug discovery, yet their structural complexity poses significant challenges for analogue generation. Here we present DerivaLM, a GPT−2−based generative model trained on USPTO−mined NP derivatization reactions that learns the chemical language of NP modification from experimental data. Starting from V1 (15% validity) and progressing through systematic architectural improvements to V5 (59% validity, 42% uniqueness, 145/200 NPs covered), DerivaLM generates 2,468 unique valid SMILES from 200 target NPs. Comprehensive characterization demonstrates that 99.9% of generated scaffolds are novel versus the ~213,000 scaffolds in the COCONUT NP database, while maintaining mean Tanimoto similarity of 0.619 to parent NPs substantially closer than any existing NP in COCONUT (mean 0.389). Multi−target docking against four NP−relevant therapeutic targets (PARP1, HDAC6, EGFR, Topo II) reveals potent predicted binding affinities reaching −12.09 kcal/mol (PARP1), with Lig_014 emerging as a multi−target hit. Pharmacophore analysis confirms functional group preservation, and drug−likeness evaluation identifies 15.1% Lipinski−compliant molecules with favorable synthetic accessibility (mean SA Score 4.09). DerivaLM demonstrates that chemical reaction data can effectively bridge the gap between NP chemical space and synthesizable, target−specific analogues.

P3-03

Characterization, antibacterial mechanisms, and toxicity assessment of *Fagonia indica*-derived AgNPs and chitosan-functionalized nanocomposites

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Green synthesis of silver nanoparticles (AgNPs) and chitosan–functionalized silver nanoparticles (Cs@AgNPs) was achieved using Fagonia indica extract. The synthesized nanomaterials were characterized by UV–Vis, FTIR, HR–XRD, TEM, SEM–EDS, DLS, and zeta potential analyses. UV–Vis spectroscopy confirmed nanoparticle formation with a surface plasmon resonance peak at 422 nm. TEM analysis revealed predominantly spherical nanoparticles with average sizes of 17.24 nm for AgNPs and 20.43 nm for Cs@AgNPs, while XRD confirmed the crystalline face–centered cubic structure of metallic silver. Antibacterial activity was evaluated against *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*. AgNPs exhibited MIC values as low as 3.12 μg/mL, whereas Cs@AgNPs showed MIC values of 6.25–12.5 μg/mL. At 50 μg/mL, AgNPs and Cs@AgNPs produced inhibition zones up to 16.67 and 17.00 mm, respectively. Bio–TEM, protein/nucleic acid leakage assays, and LIVE/DEAD staining demonstrated membrane disruption, increased permeability, and bacterial cell death. These findings indicate that *F. indica*–mediated AgNPs and Cs@AgNPs possess promising antibacterial activity and may serve as potential candidates for combating antimicrobial–resistant bacterial infections.

P3-04

Upcycling banana (*Musa* spp.) agro-waste into functional polysaccharides: Influence of extraction pH on structure, antioxidant activity, and functionality

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Banana flower is an abundant agro-residue that remains largely underutilized despite its potential as a source of functional polysaccharides. This study investigated the influence of extraction pH (2–12) on the structural, functional, and antioxidant properties of banana flower polysaccharides (BFPs). Extraction yield increased from 7.64% to 14.04% with increasing pH, whereas acidic and near-neutral conditions preserved higher-molecular-weight fractions (16.90–18.53 kDa) compared with alkaline extraction (9.74 kDa). FTIR and NMR analyses confirmed that BFPs were predominantly arabinogalactan-rich polysaccharides containing uronic acid and rhamnose residues. Increasing extraction pH promoted de-esterification and partial depolymerization, resulting in enhanced solubility (88.25%) and emulsifying activity (60.64%). In contrast, acidic extracts exhibited greater emulsion stability and stronger structural integrity. Antioxidant activity was also influenced by extraction pH: acidic extracts showed superior ABTS radical scavenging and ferric reducing power, while alkaline extraction yielded low-molecular-weight fractions with improved DPPH scavenging activity. These findings demonstrate that extraction pH modulates the structure-function relationships of banana flower polysaccharides and highlight a sustainable strategy for converting banana flower agro-waste for specific food applications.

P3-05

Isolation and identification of p-hydroxybenzyl methyl ether from *Gastrodia elata*

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Phenolic derivatives are major bioactive constituents of *Gastrodia elata* rhizome. Gastrodin and 4−hydroxybenzyl alcohol have been widely used as marker compounds for evaluating the quality and biological activity of *G. elata*. However, the contents of these compounds are relatively low in fresh Korean *G. elata*, whereas p−hydroxybenzyl methyl ether (p−HBME) is present as a major phenolic constituent. p−HBME was isolated from *G. elata* and its structure was characterized in this study. The compound was purified using repeated silica gel column chromatography. Structural identification was carried out using UV spectroscopy, GC−MS, and high−resolution NMR analyses. The UV absorption maxima were observed at 223.0 and 272.5 nm, and the GC−MS spectrum showed a molecular ion peak at m/z 138. Characteristic proton and carbon signals were also confirmed by ^{1}H− and ^{13}C−NMR analyses. These findings provide fundamental spectroscopic data for p−HBME and contribute to the characterization of phenolic constituents in *G. elata*.

P3-06

추출조건에 따른 건조 마 추출액 특성

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마는 마과에 속하는 덩굴성 여러해살이풀로 한국, 중국, 일본 등의 지역에서 널리 분포하는 아열대성 식물이며 전 세계적으로 650종 이상 분포하고 있다. 우리나라 전국의 산야에 걸쳐 자라며 식용 또는 약용으로 재배하기도 하는데 대표적인 재배마는 장마와 단마가 있다. 마는 위와 장을 보호하고 자양강장의 효과가 탁월하며 한방약재로 사용될 때는 산약이라고 불리는데 예전부터 식품과 약재로 사용되어 있다. 이러한 마는 주로 생으로 소비되며 건조 및 분말로 가공되기도 한다. 마는 괴경을 사용하는데 내부는 유백색이거나 황갈색을 띄고 끈끈한 점질물을 다량 함유하고 있으며 이 점질물은 단백질 71.8%, mannan 13.8%가 주성분이다. 괴경을 약재로 사용할때는 주피를 벗겨 그대로 말리거나 쪄서 말려 산약이라 부르고 자양, 강장, 지사, 거담에 사용하여 왔다. 본 연구에서는 건조 마의 추출조건에 따른 추출액 특성을 측정하였다. 추출용매는 물을 사용하였으며 가수량은 건조마 중량의 5, 10, 15배 가수하여 추출하였다. 추출온도는 80, 100, 120℃로 하였으며 추출시간은 30, 60, 90분으로 추출하였다. 가용성고형분 함량은 온도가 높고 추출시간이 증가할수록 높았으며 가수량이 증가할수록 희석되어 낮았다. 5배 가수량, 120℃, 90분 추출에서 2.07°Brix로 가장 높았다. 총폴리페놀 함량도 가용성고형분 함량과 유사한 경향으로 나타나 5배 가수량, 120℃, 90분 추출에서 561.1 mg/kg이었으며 항산화능도 유사한 경향으로 5배 가수량, 120℃, 90분 추출에서 54.9% 가장 높았다. 총폴리페놀회수량은 가수량 10배, 120℃, 60분 추출까지는 증가하나 이후 추출시간이나 온도가 증가해도 더 이상 증가하지 않아 가수량 10배, 120℃, 60분이 추출하기 적합한 조건으로 판단된다.

P3-07

Free amino acid and metabolomic profiles of domestic green tea powder

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Matcha is a powdered green tea made from the tender portions of tea leaves (*Camellia sinensis* L.) grown under shade. It has gained global popularity due to its distinctive aroma and flavor. This study aimed to analyze the free amino acid and UPLC–ESI–QTOF–MS–based non–volatile metabolites of domestic green tea powder. The green tea powder contained high levels of sucrose followed by glucose. Theanine was the most dominant free amino acid in matcha, followed by glutamic acid, arginine, aspartic acid, and threonine. Interestingly, UPLC–ESI–QToF–MS tentatively identified primary marker compounds belonging to several metabolic classes, including flavan–3–ols (epigallocatechin gallate, epicatechin, etc.), flavonol glycosides, phenolic acids, purine alkaloids, oxidation products of flavan–3–ols, and amino acids. These results indicated that theanine, epigallocatechin gallate, and theobromine, which are typically associated with a bitter taste, might contribute to the fresh and mellow attributes of green tea powder.

P3-08

감자 polyphenol oxidase의 효소학적 특성

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감자(*Solanum tuberosum* L.)로부터 아세톤 분말을 조제하여 부분 정제한 polyphenol oxidase 조효소액을 제조한 후 최적 pH, 반응 속도인자 등 효소적 특성을 조사하였다. 감자 PPO의 catechol을 기질로 한 효소의 최적 pH와 온도는 각각 6.2, 30℃를 나타내었다. 감자 PPO의 기질 특이성을 조사한 결과 기질 10 mM 농도에서 o-diphenol인 L-DOPA, catechol 및 4-methylcatechol에 높은 활성을 나타내었으나 p-diphenol인 hydroquinone, trihydroxyphenol인 gallic acid에는 거의 활성을 나타내지 않았다. 반응에 미치는 금속이온의 영향은 K^+ 과 Ca^{2+}을 제외한 Cu^{2+}, Mg^{2+} 금속이온은 PPO와 10 mM catechol 용액의 갈변 반응을 촉진하는 것으로 나타났다. 효소저해제 영향은 sodium ascorbate 10 mM 농도에서 무첨가구 대비 33.7% 잔존 활성을 보여 저해율이 가장 높은 것으로 나타났다. 30℃에서 농도별 반응 후 얻은 K_m 과 V_{max} 값은 catechol 기질에서 각각 1.96 mM, 98 unit/min mL 이었으며, L-DOPA 기질에서 각각 1.02 mM, 112 units/min mL을 나타내었다.

P3-09

Comparison and pretreatment optimization of assay methods for sodium selenate and sodium selenite

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Selenium-based food fortificants -sodium selenate (Na_2SeO_4) and sodium selenite (Na_2SeO_3)-require accurate quantification for quality assurance and regulatory compliance. National codices apply different principles: the Chinese standard uses redox titration with sodium thiosulfate, whereas the Korean Food Additives Code uses AAS/ICP following acid digestion. This study compared both approaches and optimized the pretreatment of the Korean method to establish cross-validated quantification. Both compounds (reagent grade) were assayed in parallel. The Chinese titrimetric method was performed as specified, using sodium thiosulfate titration under acidic conditions (Na_2SeO_4 for selective Se^{4+}; HCl for $Se^{6+} \rightarrow Se^{4+}$ reduction and total Se). For the Korean method, the conventional open-vessel digestion (HNO_3 followed by perchloric acid) was replaced with microwave-assisted digestion: a sample equivalent to ~100 mg selenium was digested with 8 mL nitric acid for 1 h 10 min, concentrated, and diluted to a final nitric acid concentration ≤ 10%, with a parallel blank correction. The Chinese titrimetric method conformed to specification for both compounds. With the optimized microwave digestion, the Korean instrumental method also yielded conforming results while eliminating perchloric acid and reducing digestion time and reagent use. Both methods provided comparable values, demonstrating mutual cross-validation between the titrimetric and instrumental approaches. Replacing perchloric acid digestion with microwave-assisted nitric acid digestion improved safety and efficiency while maintaining analytical reliability.

P3-10

Study on the improvement of the arsenic test method in the food utensils, containers and packaging

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The arsenic (As) test method specified in the food utensils, containers and packaging quantifies ICP-OES, with 193.7 nm adopted as the analytical wavelength. However, spectral interference at 193.7 nm has been reported in certain matrices containing materials such as Al and Fe. Therefore, it is necessary to evaluate alternative wavelengths depending on the matrix. In this study, an improved analytical method was developed and validated by applying an alternative wavelength capable of minimizing matrix effects. The improved method additionally applied 189.0 nm together with the existing 193.7 nm, and linearity, LOD and LOQ were compared between the two wavelengths. To evaluate interference effects, recovery tests were performed using As standard solutions spiked with Al and Fe. As a result, recovery at low concentrations was unstable at 193.7 nm, whereas stable recovery was observed at 189.0 nm regardless of the concentration range. These findings demonstrate that the improved ICP-OES method for As analysis can effectively address matrix interference in the testing of food utensils, containers and packaging. The proposed method is expected to enhance the reliability of the current Code and provide a scientific basis for improved safety management.

P3-11

Development of pretreatment method for microplastic analysis in fish paste

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Microplastics are a growing concern due to marine ecosystem contamination and potential human exposure through seafood consumption. Fish paste is a widely consumed processed fishery food in Korea and contains a complex matrix that may interfere with microplastic analysis. This study aimed to develop a pretreatment method for microplastic analysis. We optimized various factors such as solvent, temperature and time of organic matter decomposition. The developed method was validated for accuracy, precision, and selectivity using μ-FT-IR. The established conditions were confirmed to be valid for microplastic analysis in fish paste.

P3-12

PetTech and pet public health: Convergence of digital health, smart diagnostics, and environmental hygiene technologies

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The companion animal industry is undergoing rapid transformation through advances in digital technology, artificial intelligence (AI), biotechnology, and environmental engineering, leading to the emergence of Pet Technology (PetTech). PetTech integrates digital health monitoring, smart diagnostics, telemedicine, and environmental hygiene management to enhance companion animal healthcare. This review summarizes recent developments in PetTech, including wearable monitoring systems, artificial intelligence–based analytics, digital veterinary medicine, smart diagnostics, personalized nutrition, and environmental hygiene technologies. Wearable sensors and AI–driven analytics enable continuous health monitoring, early disease detection, and predictive healthcare. Smart diagnostic platforms facilitate rapid identification of infectious diseases and antimicrobial resistance, while environmental hygiene technologies support disease prevention and Pet Public Health. The integration of the Internet of Things (IoT), cloud computing, and big data analytics is accelerating the development of preventive and precision veterinary medicine. Despite challenges related to standardization, clinical validation, and regulatory frameworks, PetTech is expected to play a key role in advancing Pet Public Health through a data–driven, preventive, and One Health–oriented healthcare ecosystem for companion animals.

P3-13

Dog-associated zoonoses and anthelmintic resistance: Implications for food safety and one health

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Dogs serve as important epidemiological bridges linking humans, animals, and the environment, facilitating the transmission of zoonotic pathogens through direct contact, environmental contamination, and arthropod vectors. Major canine-associated zoonotic pathogens include soil-transmitted helminths and vector-borne parasites such as *Toxocara canis*, *Ancylostoma caninum*, *Dirofilaria immitis*, *Leishmania* spp., and *Ehrlichia* spp. Climate change, urbanization, and increased movement of companion animals have contributed to the global expansion of vector-borne diseases. In addition, multiple anthelmintic drug resistance (MADR) in Ancylostoma caninum has emerged as a significant challenge, reducing the effectiveness of conventional parasite-control programs. From a food safety and public health perspective, environmental contamination by canine feces and the persistence of zoonotic parasites in soil and water represent important transmission routes. Effective prevention and control require a One Health approach integrating veterinary medicine, environmental management, public health surveillance, and molecular resistance monitoring. Future strategies should focus on molecular surveillance, vector control, and evidence-based parasite management to mitigate zoonotic risks and strengthen food safety and public health.

P3-14

MOS 가스 센서의 온도 변조 응답을 통한 다양한 휘발성 물질 패턴 획득 가능성

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식품 향은 품질 평가와 신선도 판단에 중요한 지표이나, 기존 분석 장비는 고가이며 신속한 현장 적용에 한계가 있다. 본 연구에서는 저비용 MOS 가스 센서인 BME688을 이용하여 온도 변조 기반 데이터 수집 시스템을 구현하고, 알코올과 아세톤에 대한 시계열 가스 저항 응답을 측정하였다. 서로 다른 히터 프로파일을 적용한 결과, 온도 단계의 구성에 따라 서로 다른 저항 응답 패턴이 형성되었다. 동일한 히터 프로파일 조건에서는 두 시료의 전체적인 응답 파형 구조가 유사하게 나타났으나, 가스 저항값의 크기는 전반적으로 뚜렷한 차이를 보였다. 또한 일부 온도 단계에서는 두 시료 간 상대적 반응 강도 차이가 더 크게 나타나, 휘발성 물질의 차이가 온도 단계별 저항 응답 특성으로 반영될 수 있음을 확인하였다. 이는 온도 변조 조건에서 단일 센서로도 하나의 저항값 변화만이 아니라, 온도 단계에 따른 다양한 반응 정보를 얻을 수 있음을 보여준다. 이러한 결과는 BME688 센서를 활용한 온도 변조 방식이 휘발성 물질의 응답 패턴 획득에 유용할 수 있으며, 향후 커피 등 식품 향기 성분의 신속 분석과 패턴 기반 품질 평가를 위한 저비용 전자코 시스템 구축의 기초 자료로 활용될 가능성을 시사한다.

P3-15

Analysis of vitamin K content in soy-based food products commonly consumed in Korea

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Vitamin K is a fat-soluble vitamin known to play important roles in blood coagulation, bone metabolism, and cardiovascular health. Soy-based food products, such as tofu, soy milk, and soybean pulp, have been widely consumed as major food resources in Korea due to their high-quality plant protein. However, reliable information on the vitamin K1 (phylloquinone, PK) and vitamin K2 (menaquinone, 1. MK-n) content of these soybean products remains limited in the Korean Food Composition Database. This study aimed to determine the vitamin K content of 64 soybean products by 1. high-performance liquid chromatography (HPLC) with fluorescence detection and to validate the method for accuracy, precision, detection and quantification limits, and linearity. PK was detected in all soybean products analyzed, with contents of 11.63 ± 4.02 μg/100 g in tofu, 4.58 ± 1.17 μg/100 g in soft tofu, 3.18 ± 1.34 μg/100 g in soy milk, and 7.37 ± 3.13 μg/100 g in soybean pulp. MK-4 was not detected in any sample. MK-7 was only found in fermented soybean pulp (114.90 ± 46.48 μg/100 g, where it represented the predominant form produced during fermentation. These findings provide reliable vitamin K data to support a Korean food vitamin K database.

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P3-16

Comprehensive characterization of vitamin B6 vitamers, folate, and antioxidant properties in common fruit and vegetable juices for national food composition database development

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This study evaluated vitamin B6 vitamers, folate, and antioxidant properties of 19 widely consumed fruit and vegetable juices (9 vegetables, 10 fruits) selected for the Korean National Food Composition Database (NFCD). Analytical methods using HPLC-FLD for vitamin B6 and microbiological assay for folate were validated prior to sample analysis. Total vitamin B6 and folate contents ranged from 3 to 216 μg/100 g and 2.07 to 86.01 μg/100 g, respectively. *Brassica oleracea* var. *italica* (broccoli) juice exhibited the highest total vitamin B6 content (216 μg/100 g), whereas Pyrus pyrifolia (pear) juice showed the lowest level (3 μg/100 g). *Triticum aestivum* (wheatgrass) juice contained the highest folate concentration (86.01 μg/100 g), while *Pyrus pyrifolia* juice had the lowest value (2.07 μg/100 g). Vegetable juices generally contained higher vitamin levels than fruit juices. Considerable variation in PN, PL, and PM composition was observed among samples. Principal component analysis (PCA) explained 69.4% of the total variance and clearly separated vegetable and fruit juices. Correlation analysis revealed positive relationships between folate and total phenolic content (r=0.75) and between total phenolic content and ABTS radical scavenging activity (r=0.86). Hierarchical clustering further grouped nutrient-rich vegetable juices into distinct clusters. These findings provide comprehensive compositional data on vitamin B6 and folate in commonly consumed juices, contributing to the enhancement of the NFCD while improving understanding of micronutrient-antioxidant relationships.

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P3-17

Citrus reticulata peel pectin as a bio-stabilizer: Structural insights and functional performance in super-premium ice cream

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Tangerine peel is a significant agricultural by-product with untapped potential for upcycling. This study characterized pectin from *Citrus reticulata* Blanco peel and evaluated its efficacy as a bio-stabilizer in a high-fat (16%) dairy matrix. Monosaccharide profiling revealed a heteropolysaccharide rich in galacturonic acid (45.40%) with a substantial rhamnogalacturonan-I fraction (61.80%). FT-IR confirmed a high-methoxyl configuration (DE: 62.92%), indicating a branched architecture capable of water-binding through hydrogen bonding. Pectin (0.1 – 0.4% w/w) induced dose-dependent modulation of the multiphase system, exhibiting increased overrun with concomitant reductions in density and melting rate, attributed to a three-dimensional network stabilizing air cells and retarding heat transfer. Power Law fitting (R^2=0.98) showed pectin increased flow behavior index (n) over 100% while maintaining pseudoplasticity ($n<1$). Lower concentrations (0.1 – 0.25%) caused instability via bridging flocculation of casein micelles, whereas 0.4% w/w achieved phase equilibrium comparable to commercial benchmarks. These findings establish tangerine peel pectin as a sustainable alternative to synthetic stabilizers, offering superior textural control and emulsion stability in aerated frozen systems.

P3-18

어류의 가공방법에 따른 5종 농약 잔류량 변화

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본 연구는 굽기, 찌기 및 튀기기 조리 과정 중 뱀장어, 붕어, 메기의 alachlor외 4종 농약 잔류량을 비교하기 위해 수행하였다. 농약 감소 경향을 확인하기 위해 어류에 검출되는 양보다 높은 농도로 침지 하였다. 침지 한 시료는 흐르는 물로 20초간 세척 후 가공하였다. 오븐 굽기의 경우 220℃, 12분간 가열, 팬 굽기는 180℃, 6분 가열하였다. 찜은 20분 조리 후 5분간 뜸을 들여 조리했으며, 튀기기는 180℃, 12분 튀겼다. 잔류량은 GC-MS/MS를 이용하여 분석하였다. 정량한계는 0.01 mg/kg이었으며, 회수율은 적정 기준을 만족하여 시험법의 적합성을 판단하였다, 어류 중 농약 5종의 초기 잔류량은 0.16-1.09 mg/kg 이었으며, 팬과 오븐 굽기의 잔류량은 각각 0.15-0.61, 0.17-0.54 mg/kg이었다. 튀김의 경우 0.16-0.52 mg/kg, 찜의 경우 0.13-0.66 mg/kg으로 나타났다. 볶기, 굽기 및 튀김의 경우 가열 시간이 증가할수록 일부 잔류량이 높아지는 경향을 나타냈으며, 가열에 의해 수분함량이 감소하여 잔류량이 증가한 것으로 판단된다. 찜의 경우 가열 시간이 증가할수록 잔류량이 감소되었으며, 찌는 과정에서 열에 의해 분해되어 감소된 것으로 판단된다.

P3-19

Analysis of veterinary drug residues in livestock and fishery products distributed in Korea

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The increasing use of veterinary drugs in the livestock and fisheries industries has raised concerns regarding their overuse and the occurrence of veterinary drug residues in food products. Furthermore, antibiotic residues and the emergence of antimicrobial-resistant bacteria associated with the excessive use of veterinary drug may pose a significant risk to human health, requiring thorough management. This study aimed to investigate the occurrence of veterinary drug residues in livestock and fishery products distributed in Korea. Samples were collected from beef, pork, chicken, milk and fishery products. A total of 30 substances prohibited in food and 75 veterinary drug residues were analyzed using liquid chromatography mass spectrometry (LC-MS/MS) and gas chromatography (GC). Among the analyzed samples, no veterinary drug residues were detected in beef, pork, milk and chicken. Ethoxyquin was detected exclusively in fish samples at concentrations ranging from 0.02 to 0.11 mg/kg. However, the detected levels were below the maximum residue limit (MRLs) of 1.0 mg/kg specified in the Korean Food Code. These results indicate that livestock and fishery products distributed in Korea comply with current safety standards regarding veterinary drug residues.

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P3-20

Validation of analysis method for the simultaneous determination of five pyridine alkaloids in food using LC-MS/MS and the risk assessment

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Pyridine alkaloids (PAs) are plant-derived toxins primarily found in *Nicotiana* spp., including tobacco, and also occur in certain agricultural and livestock products. While standardized methods for nicotine analysis in food have been established in the EU, Korea has yet to implement such standardized protocols. In this study, a method based on QuEChERS extraction followed by LC-MS/MS analysis was developed for the determination of five PAs. Validation was performed across six food matrices. The method exhibited excellent linearity (R^2 >0.99) and selectivity, with accuracy ranging from 80.0 – 118.1% for all matrices. LOD and LOQ in the six matrices were as follows: Nicotine (LOD 3.05 – 10.48 ng/g, LOQ 7.85 – 26.97 ng/g), Nornicotine (0.99 – 1.86/2.55 – 4.79), Cotinine (0.021 – 0.032/0.054 – 0.081), Myosmine (0.94 – 2.95/2.41 – 7.60), and Anabasine (0.56 – 2.38/1.44 – 6.13). The method is suitable for the simultaneous determination of five PAs and complies with CODEX performance criteria. And five PAs were investigated in 600 agricultural, processed and livestock products. They were detected in 33 samples, resulting in a detection rate of 5.5%. However, the risk assessment results showed that the risk for all detected samples were less than 1% of the ADI, indicating a very low risk to human health.

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P3-21

Comparison of LC-MS-based non-volatile metabolites of three *Hydrangea serrata* cultivars

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Hydrangea serrata is a deciduous shrub native to East Asia, particularly China and Korea. The leaves have traditionally been used to treat fever, cough, and gastrointestinal disorders, and have natural sweetening properties attributed to dihydroisocoumarins and stilbenoids. In this study, the metabolomic characteristics of three *H. serrata* cultivars (Korea, China, and Europe) were compared using ultra-performance liquid chromatography-quadrupole time-of-flight mass spectrometry (UPLC-QToF-MS)-based non-volatile metabolite analysis. Fifty-five compounds including 14 dihydroisocoumarins, 8 stilbenoids, 11 flavonoids, and other compounds (iridoids, megastigmanes, and fatty acids) were identified in the leaves of *H.serrata*. These Principal Component Analysis (PCA) score plots exhibited that all three cultivars were distinguishable. Variable Importance in Projection (VIP) analysis identified 14 significantly different metabolites among the three *H. serrata* cultivars. The contents of dihydroisocoumarins and stilbenoids, known as bioactive compounds in *H. serrata*, were relatively higher in the Korean cultivar. These findings contribute to understanding the compositional characteristics of different cultivars of *H. serrata*.

P3-22

Isolation and structural determination of flavonoids from licorice (*Glycyrrhiza uralensis*)

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Licorice (*Glycyrrhiza uralensis*) is a medicinal plant widely used in traditional Korean medicine. It contains triterpene saponins (glycyrrhizin), phenolic compounds, and flavonoid glycosides, which has shown anti-inflammatory, antioxidant, and hepatoprotective activities. 'Wongam' is the first domestic licorice cultivar, but its non-volatile metabolome remains poorly characterized. In this study, Liquid chromatography – electrospray ionization – quadrupole time-of-flight mass spectrometry (LC-ESI-QToF-MS) metabolomic analysis of Wongam tentatively identified 70 metabolites, including licorice saponins, licorice glycosides, and flavonoids. Bioactive compounds were further purified and isolated by ODS and silica gel column chromatography. Five compounds were identified as licuraside, a licuraside isomer, isoliquiritin apioside, liquiritigenin 7-O-D-apiosyl-4′ -O-D-glucoside, and liquiritin apioside by LC-ESI-QToF-MS and ^{1}H and ^{13}C NMR spectroscopy.

P3-23

Chemical constituents and structural determination of bioactive compounds from Godulbaegi (*Crepidiastrum sonchifolium*)

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Godulbaegi (*Crepidiastrum sonchifolium*), a member of the Compositae family, has been widely used as a food and a traditional medicine in East Asia. Previous studies have reported that this plant contains various bioactive compounds, including sesquiterpene lactones, flavonoids, and phenolic acids, and exhibits diverse health-beneficial effects, such as anticancer, anti-inflammatory, cardioprotective, and neuroprotective activities. However, studies on the bioactive compounds of Godulbaegi remain limited. Therefore, this study aimed to investigate the chemical constituents of Godulbaegi and identify its bioactive compounds. In UPLC-ESI-QToF-MS analysis, a total of 106 compounds, including sesquiterpene lactones, flavonoids, and phenolic acids, were detected in the methanol extract. Five sesquiterpene lactones and two flavonoids were isolated from the n-butanol and ethyl acetate fractions using ODS-MPLC and HPLC. Their structures were elucidated by HR-ESI-MS and NMR analyses. These findings highlight Godulbaegi as a valuable source of bioactive sesquiterpene lactones and support its further utilization as a functional food resource.

P3-24

Isolation and structural determination of flavonoids from kale pomace

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Kale (*Brassica oleracea* L.) is widely consumed as pressed juice in Europe and North America to support immune health and reduce inflammation. Kale juice is rich in vitamins and antioxidants, including carotenoids, flavonoids, and phenolic acids. Further investigation into up-cycling of kale pomace, which is rich in polysaccharides and bioactive compounds, is warranted. The 70% ethanol extracts of kale pomace exhibited high DPPH radical-scavenging activity and ferric reducing antioxidant power. In this study, we analyzed the non-volatile metabolomic profile of kale pomace 70% ethanol extracts. A total of 40 metabolites, including 12 flavonol glycosides, lipids, and others were tentatively identified by UPLC-ESI-QTOF-MS analysis. Among them, flavonol glycosides were found to be the predominant metabolites in kale pomace. Two compounds were purified and isolated using ODS and silica gel column chromatography. These isolated compounds were identified as kaempferol-3-O-diglucoside-7-O-glucoside and kaempferol-3,7-O-diglucoside by MS and ^{1}H-NMR analyses.

P3-25

Isolation and structural determination of anthocyanins from *Raphanus sativus* L.

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Raphanus sativus L. is a root vegetable belonging to the Brassicaceae family. Recently, various colored radish cultivars have been developed and consumed due to their distinct health benefits. In particular, purple radish, which is rich in anthocyanins, is recognized for its health-promoting effects, including antioxidant, anti-diabetic, and anti-inflammatory activities. Although several acylated anthocyanins have been identified in purple radish, further research is required to structurally determine remaining unidentified compounds. Therefore, this study aimed to purify, isolate, and elucidate acylated anthocyanins from purple radish. The 70% MeOH extract of purple radish was solvent-fractionated to obtain n-butanol (BuOH) fraction. In the LC-ESI-QToF-MS result, 30 acylated anthocyanins were detected in the BuOH fraction. Six anthocyanins were purified and isolated using ODS column chromatography and ODS-HPLC. Among them, two acylated anthocyanins were identified as cyanidin glucosides coupled with p-coumaroyl, feruloyl, and malonyl groups by MS and 1D and 2D NMR analyses.

P3-26

Analytical method development and validation for polycyclic aromatic hydrocarbons (PAH4) in coffee using GC-MS

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Coffee is one of the most widely consumed foods in Korea, with increasing consumption. Meanwhile, coffee may contain polycyclic aromatic hydrocarbons (PAHs) formed during the roasting process, highlighting the need for an analytical method for their determination. In this study, a GC–MS method was developed for the determination of four PAHs (benzo[a]pyrene, benzo[a]anthracene, benzo[b]fluoranthene, and chrysene) in commercially distributed coffee products in Korea (roasted coffee and instant coffee) and coffee extracts prepared under consumption conditions (espresso, drip coffee, and cold brew). Light–roasted coffee, light–roasted instant coffee, and drip coffee were selected as representative matrices for roasted coffee, instant coffee, and coffee extracts, respectively. The calibration curves showed excellent linearity ($R^2 \geq 0.99$). The limits of detection (LOD) and limits of quantification (LOQ) were 0.018 – 0.083 and 0.054 – 0.251 μg/kg for roasted coffee, 0.049 – 0.083 and 0.148 – 0.252 μg/kg for instant coffee, and 0.005 – 0.016 and 0.016 – 0.049 μg/kg for coffee extracts, respectively. Accuracy and precision were 81.6 – 111.2% and 0.4 – 11.5% for roasted coffee, 89.4 – 113.8% and 0.3 – 8.4% for instant coffee, and 81.6 – 111.9% and 0.2 – 4.2% for coffee extracts, respectively.

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P3-27

Improved HPLC-UV quantification and LC/MS-based identification of hesperidin and enzymatically modified hesperidin

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Hesperidin and enzymatically modified hesperidin (EMH) are used as food additives for nutritional fortification, and the current Korean Food Additives Code specifies a spectrophotometric method and an HPLC method for their analysis, respectively. This study established a common HPLC–UV method for the quantitative determination of both compounds and evaluated the applicability of an LC/MS method for qualitative identification. HPLC–UV analysis was performed using a Capcell Pak C18 MG II column (4.6 mm × 250 mm, 5 μm) with a mobile phase of acetonitrile and water (20:80, v/v) containing 0.1% trifluoroacetic acid. The hesperidin calibration curve showed good linearity (R^2>0.99), and the limits of detection and quantification were 0.23 and 0.70 mg/L, respectively. Intra- and inter-day contents were 93.89–94.55% and 94.33–95.07%, respectively, with corresponding precisions of 0.3% and 0.1%. For LC/MS analysis, acetonitrile and water (20:80, v/v) containing 0.1% formic acid were used as the mobile phase. The deprotonated molecular ions $[M-H]^-$ of monoglucosyl hesperidin and hesperidin were detected at m/z 771 and 609, respectively. These results suggest that the complementary use of the two methods may be useful for the quality control of hesperidin and enzyme-modified hesperidin.

P3-28

Screening of polyphenol and flavonoid profiles in Imsil peach and plum using UPLC-QTOF-MS-based non-targeted metabolomics

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This study aimed to evaluate the functional values of representative agricultural products from Imsil Peach (*Prunus persica*) and Plum (*Prunus mume*) by screening their major polyphenols and flavonoids using Waters UPLC−QTOF−MS−based non−targeted metabolomics. Lyophilized samples extracted with 80% methanol were incorporated with zidovudine as an internal standard, separated on an Acquity UPLC BEH C18 column, and analyzed in electrospray ionization (ESI)−negative mode. Metabolite profiling indicated phytochemical fingerprints influenced by the raw materials. In plum, high intensities of malic acid (m/z 133.01) and citric acid (m/z 191.02) were screened. In contrast, peach exhibited glycosylated phenolic acids, such as 1−O−caffeoyl−beta−D−glucose (m/z 341.09) and vanillic acid 4−beta−D−glucoside (m/z 329.07). Various chlorogenic acid isomers and flavonoid groups, including apigenin 7−O−glucuronide and apigenin 4′ −O−glucuronide, were generally identified in both products. In particular, cis−chlorogenic acid (m/z 353.07) was significantly detected in peach and showed the definite metabolic difference. These results establish the abundant phenolic compounds of Imsil peach and plum, providing a baseline for developing high−value functional foods utilizing regional resources.

P3-29

AI-assisted prediction of positional-specific lipases for the discovery of novel lipolytic enzymes

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Lipases are important biocatalysts for the production of structured lipids; however, conventional enzyme discovery based on microbial isolation and activity screening is often labor-intensive, time-consuming, and inefficient. This study established an integrated sequence-to-function pipeline for discovering novel lipolytic enzymes by combining machine learning-based classification, protein structure prediction, and recombinant validation. Lipase-related sequences were collected from public databases, including UniProt, PDB, NCBI, and the Lipase Engineering Database, and sequence-derived features such as amino acid composition, physicochemical properties, stability indices, elemental composition, and charge properties were extracted for model construction. A two-stage classification strategy was applied to distinguish non-specific lipases from other groups and to further classify sn-1,3-specific candidates. Among the tested algorithms, ensemble models showed high predictive performance, while the CN2 rule-based model provided interpretable classification suitable for experimental prioritization. The trained framework was applied to 34,004 putative lipases, and selected candidates were further examined using AlphaFold3-based structural prediction and ligand-binding analysis, focusing on catalytic triad geometry, catalytic Ser–ligand distance, and lid-domain characteristics. One candidate was expressed using a baculovirus–insect cell system and biochemically characterized. The recombinant enzyme exhibited lipase activity toward p-NPP and triolein and showed non-regiospecific hydrolysis of triacylglycerol. Overall, this study demonstrates that integrating AI-based prediction, structural screening, and experimental validation can accelerate the systematic discovery of functional lipases for food lipid applications.

P3-30

Determination of acrylamide in roasted coffee and coffee extracts by LC-MS/MS

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Acrylamide (AA) is a representative substance formed through the Maillard reaction during food manufacturing processes. In coffee, AA can be generated during roasting and is known as one of the major food groups that may contribute to AA exposure due to high consumption. Therefore, an analytical method for the accurate quantification of AA in coffee products is needed. This study aimed to validate an analytical method for AA in commercially available roasted coffee and coffee extracts. Samples were analyzed using LC–MS/MS after SPE preparation, and selectivity, linearity, limit of detection (LOD), limit of quantification (LOQ), accuracy, and precision were evaluated to confirm method applicability. The developed method showed good linearity with a calibration curve of $R^2 \geq 0.99$. The LOD and LOQ were 1.01 μg/kg and 3.04 μg/kg, respectively, indicating that the method is suitable for the detection and quantification of AA at low concentration levels in coffee products. Accuracy and precision ranged from 90.0 to 100.5% and from 3.7 to 6.4%, respectively. The validated LC–MS/MS method was suitable for the analysis of AA in roasted coffee and coffee extracts and is expected to be applicable for future monitoring, exposure assessment, and risk assessment of AA in coffee products.

P3-31

Effect of pretreatment and extraction methods on the volatile aroma profiles of fig (*Ficus carica* L.) fruit

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This study investigated the effects of pretreatment and extraction methods on the volatile aroma profiles of fig (*Ficus carica* L.) fruit. Two cultivars (Masui Dauphine and Longue d'Aout) were evaluated under various pretreatment conditions, and the Masui Dauphine cultivar under the optimal pretreatment condition was selected for extraction based on GC–MS analysis. The selected sample was extracted using supercritical fluid extraction (SCF), 70% ethanol extraction, essential oil extraction (EO), and simultaneous distillation–extraction (SDE). Fresh ripe fig fruit was used as the reference sample, and volatile compounds were identified and semi-quantified by GC–MS. EO extracts exhibited floral and citrus characteristics with high proportions of aldehydes and alcohols. SCF extracts showed woody, spicy, balsamic, and dry notes and were characterized by abundant aldehydes, aromatic compounds, and terpenes. In contrast, 70% ethanol extracts exhibited sweet, fatty, waxy, oily, and creamy characteristics with greater contributions from esters, alcohols, and fatty acid–derived compounds. SDE extracts showed an intermediate aroma profile between EO and 70% ethanol extracts. These findings provide useful information for the development of fig–derived flavorings and aroma formulations.

P3-32

Optimization of LC-MS/MS and pretreatment conditions for nisin determination in cultured meat-related samples

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Nisin, produced by *Lactococcus lactis*, is an antimicrobial peptide used as a preservative against Gram-positive bacteria. Monitoring residual nisin is important for safety and quality control in cultured meat production. This study optimized LC-MS/MS and pretreatment conditions for nisin determination in cultured meat-related samples by evaluating column type, BSA buffer, vial material, and extraction solvent. In standard analysis, SM-C18 showed a detectable peak at 20 μg/L, whereas CW-C18 showed detection from 50 μg/L. SM-C18 also showed better calibration linearity than CW-C18 (R^2 = 0.9927 and 0.9503, respectively) and was selected for pretreatment optimization. BSA buffer tended to reduce time-dependent signal loss, particularly at 50 μg/L, and PP vials showed acceptable repeatability. In nisin-spiked pork and complete medium, methanol/water/formic acid 5:4:1 (v/v/v) produced higher peak responses than 2:7:1 in both matrices and was selected as the extraction solvent for subsequent analysis. These optimized conditions provide a basis for further validation of residual nisin monitoring in actual cultured meat samples.

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P3-33

Research on contamination of PFASs in food matrices

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Per- and polyfluoroalkyl substances (PFAS) constitute a chemically diverse group of synthetic organofluorine compounds, distinguished by their remarkable stability, capacity to migrate through the environment, and resistance to breakdown. This review consolidates existing knowledge regarding PFAS toxicity, methods of analytical detection, presence within food systems, and consequences for assessing risks to human health. Findings from both laboratory studies and population-based research indicate that exposure to these compounds is linked to numerous adverse health outcomes, among them suppressed immune function, hormonal disruption, liver damage, impaired reproductive and developmental processes, neurological effects, and potential cancer risk. Because PFAS persist at low concentrations within intricate sample matrices, sophisticated analytical techniques are required; liquid chromatography paired with tandem or high-resolution mass spectrometry, alongside solid-phase extraction and QuEChERS-based preparation methods, constitute the foundation of modern PFAS analysis. These compounds are frequently identified across diverse food categories including seafood, meat, dairy, grains, and produced as a result of environmental pollution, accumulation within biological tissues, and leaching from materials in contact with food; consumption of food represents the chief route of exposure among the public. Although regulatory frameworks have advanced, considerable gaps in understanding remain concerning the combined toxicity of PFAS mixtures, the safety profile of newer short-chain variants, and their long-term impact on health. Closing these gaps will require harmonized analytical protocols, broader monitoring initiatives, and more thorough risk assessment models.

P3-34

Bromoform in biological systems: An overview toxicity, analytical methods, occurrence, and risk assessment

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In environmental and food chemistry, food safety, toxicity, and climate change mitigation research, hence Bromoform, a naturally occurring and man-made brominated trihalomethane is becoming evidently important. Marine species, especially macroalgae like Asparagopsis taxiformis, naturally generate it. It is also created as a disinfection by-product when bromide-containing water is chlorinated. Bromoform has drawn a lot of interest lately due to its potent anti-methanogenic action in ruminants, where it significantly lowers intestinal methane emissions and inhibits important enzymatic pathways in methanogenic archaea. However, its potential role as a feed-related methane mitigation agent raises important concerns regarding toxicological effects, residue transfer into animal-derived foods, environmental persistence, atmospheric bromine release, and possible ozone-related impacts. This review summarizes current knowledge on bromoform toxicity, analytical determination, occurrence, and risk assessment across environmental, biological, and food-related systems. Evidence indicates that bromoform may exert cellular toxicity in aquatic organisms, cause severe acute poisoning in humans at high exposure levels, and contribute to health risks as part of brominated disinfection by-products in drinking water and processed foods. The detection and monitoring of bromoform in water, seafood, seaweed extracts, and animal feed matrices have been enhanced by analytical techniques such GC-ECD, GC-MS, headspace solid-phase microextraction, and fast spectroscopy methods. According to occurrence investigations, Bromoform comes from both natural marine biogenic processes and human water treatment methods. The availability of bromide, organic precursors, chlorination conditions, pH, ammonia, and seasonal variations all affect the amounts of bromoform. According to risk assessments, exposure routes, chemical speciation, dosage, matrix, and ingestion routes are important determinants of ecological and human risk. Overall, bromoform represents a compound of dual significance which includes; offers potential benefits for methane reduction but requires careful safety evaluation, standardized analytical monitoring, and integrated environmental risk management before broader application in sustainable agricultural and food systems.

P3-35

Isolation and identification of lignan glucosides from sesame seed cake

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Sesame (*Sesamum indicum* L.) is an oilseed crop belonging to the family Pedaliaceae. It is widely consumed as sesame oil, paste, and a food garnish. Sesame seeds mainly contain various lignans, including sesamin, sesamolin, and lignan glycosides such as sesaminol glucosides and sesamolinol glucosides. Sesame seed cake, a by-product of oil extraction, is rich in proteins, polysaccharides, and phenolic compounds. Our previous study demonstrated that hot water extract of sesame seed cake exhibited skin-whitening and anti-wrinkle activities. In this study, we isolated and identified bioactive compounds from sesame seed cake. Lignan glucosides were detected as the main compounds in the water-saturated n-butanol (BuOH) fraction of sesame seed cake hot water extract using UPLC-ESI-QTOF-MS analysis. Four lignan glucosides were purified and isolated from the BuOH fraction using ODS and silica gel column chromatography. These compounds were identified as sesaminol triglucoside, two sesaminol diglucosides, and piperitol diglucoside, based on HR-ESI-MS and NMR analyses. In vitro skin-beneficial activities of the isolated lignan glucosides will be evaluated.

P3-36

Metabolomic profiling of ramie leaves across growth stages (May to October) using UPLC-ESI-QTOF-MS

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Ramie (*Boehmeria nivea* L. Gaudich), a perennial herbaceous plant belonging to the family Urticaceae, is widely distributed throughout Asia, including Korea, China, and India. The leaves are traditionally used to make a popular Korean rice cake, known as mosi-tteok. The leaves contain numerous bioactive compounds, including flavonoids, phenolic acids, and carotenoids. Several compounds have been demonstrated to exhibit various biological activities, such as anti-inflammatory, anti-viral, anti-bacterial, anti-tumor, and antioxidant activities. We hypothesized that bioactive compounds in ramie leaves vary depending on growth stages. Therefore, this study aimed to perform metabolomic profiling of ramie leaves collected from May to October using UPLC-ESI-QTOF-MS. Metabolomic profiling tentatively identified 63 compounds in hot water extract of ramie leaves, including phenolic acids, megastigmanes, flavonoids, and lipids. The PLS-DA score plot demonstrated that ramie samples from May to October were clearly distinguishable. The ramie leaves collected in July exhibited higher levels of megastigmanes and flavonoids than samples collected at other growth stages, whereas several flavonol glycosides gradually decreased throughout the growth period.

P3-37

Effects of cooking methods on the phospholipid content and composition of agricultural and livestock products

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Phospholipid (PL) contents in vegetables (11 types), fruits (8 types), cereals and cereal products (4 types), and eggs (2 types) were analyzed before and after cooking treatments (blanching, roasting, drying, steaming, and boiling) using HPLC–ELSD. In vegetables, phosphatidylethanolamine (PE), phosphatidylcholine (PC), and phosphatidylinositol (PI) were the major phospholipids, and total PL contents increased after blanching. Specifically, total PL content in Aralia elata increased from 533.93 to 2017.22 mg/100 g dry weight (DW) ($p<0.05$). In fruits, PE, PC, and PI were the major phospholipids, and nectarine showed the highest total PL content (155.21 mg/100 g DW). In cereals and cereal products, PE, PC, PI, and lysophosphatidylcholine (LPC) were detected, and total PL contents of Daehak waxy corn and super sweet corn increased 3.81– and 1.30–fold after steaming, respectively ($p<0.05$). In eggs, PE, PC, sphingomyelin (SM), and LPC were the major phospholipids, and PC showed the highest content (1486.49 – 3853.99 mg/100 g fresh weight). This study confirmed that the composition and content of PLs vary according to food type and are affected by cooking methods. These findings may serve as basic data for establishing a functional component database for agricultural and livestock products.

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P3-38

Stability and *in vitro* bioavailability of liposomal fisetin prepared with saturated phosphatidylcholines

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To overcome the low bioavailability of the hydrophobic compound fisetin, liposomal fisetin (Lipo-F) was prepared using DPPC, DSPC, Soy PC, and Soy PC+cholesterol, and their stability and in vitro bioavailability were evaluated. All Lipo-F formulations exhibited particle sizes below 146 nm; however, the particle sizes of DSPC-, DPPC-, and Soy PC-based Lipo-F increased after 14 days of storage. After 14 days under different pH conditions (2, 5, and 7), fisetin retention followed the order of DSPC > DPPC > Soy PC+cholesterol > Soy PC > free fisetin ($p<0.05$). Soy PC showed a higher tendency for calcein release than DPPC and DSPC. The in vitro bioavailability determined using Caco-2 cells was significantly higher for all Lipo-F formulations than for free fisetin ($p<0.05$). During the 8 h incubation period, Soy PC-based Lipo-F exhibited the highest bioavailability, whereas DSPC- and DPPC-based Lipo-F showed lower initial bioavailability but gradually increased over time, resulting in no significant difference compared with Soy PC-based Lipo-F after 8 h ($p>0.05$). These results indicate that PC-based liposomes enhance the stability and bioavailability of fisetin and have strong potential as effective delivery systems for hydrophobic bioactive compounds.

P3-39

Evaluation of true retention of cobalamins in chicken for the national food composition database

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Cobalamins are essential water-soluble micronutrients involved in nervous system maintenance, DNA synthesis, and hematopoiesis, and occur mainly in animal-derived foods. Reliable cobalamin data are needed for dietary assessment, especially for deficiency-risk groups such as vegans, older adults, and gastrectomy patients. For national health promotion and personalized precision nutrition, a reliable National Food Composition Database (NFCDB) is required. Although chicken is frequently consumed in Korea, current data are mainly based on raw chicken, and retention data by part and cooking method remain limited. Therefore, this study validated a cobalamin analytical method and evaluated cobalamin contents and stability in five chicken parts under raw, boiled, and oven-roasted conditions. Cobalamins were converted to cyanocobalamin and quantified using immunoaffinity-HPLC-DAD. The method showed excellent linearity (R^2 〉 0.9999), with LOD and LOQ values of 0.0112 and 0.0301 μg/100 g. Recovery ranged from 82.7% to 114.0%, and precision satisfied AOAC criteria. Cobalamin contents were 0.18 – 0.49 μg/100 g in raw samples and 0.15 – 0.47 μg/100 g after cooking. True retention ranged from 38.8% to 127.0%. These results support NFCDB improvement and precision nutrition assessment.

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P3-40

Development and validation of an LC-MS/MS method for the simultaneous determination of artemisinin and related compounds in soybean oil

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Artemisinin is a naturally occurring sesquiterpene lactone found in *Artemisia annua* L. It has been widely studied for its antimalarial activity; however, potential toxicological concerns related to exposure levels require attention from a food safety perspective. Therefore, a reliable analytical method is needed for the quantification of artemisinin in food matrices. In this study, an ultrasound-assisted extraction (UAE) method combined with LC-MS/MS was developed and validated for the simultaneous determination of artemisinin, artemisitene, dihydroartemisinic acid, and artemisinic acid. Food matrices were categorized by moisture content as high (>66%), medium (33-66%), or low (<33%) and further classified by fat, carbohydrate, and protein contents using a modified AOAC food triangle. Soybean oil was selected as a representative low-moisture, high-fat matrix. Spiked samples were extracted by UAE using an organic solvent, followed by centrifugation, concentration, reconstitution, and LC-MS/MS analysis. The method showed good linearity, accuracy, and precision for the target compounds, with a total run time of 17 min. These results indicate that the proposed method can be applied to quantitative analysis of artemisinin-related compounds in a high-fat food matrix.

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P3-41

Compositional analysis of ether phospholipids from aquatic foods and evaluation of cellular uptake

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Ether phospholipids (ePLs) are classified into plasmenyl and plasmanyl forms, with plasmenyl PL being functional lipids abundant in aquatic foods and associated with cognitive benefits. This study analyzed the ePL composition and content in crude lipid extracted from mud snail, green-lipped mussel, and scallop via HPLC-ELSD, and subsequently prepared their liposomal forms to evaluate intestinal cellular uptake using Caco-2 cells. Ether-phosphatidylethanolamine (PE) content was highest in mud snail (121.19 mg/g), followed by green-lipped mussel (46.88 mg/g) and scallop (31.51 mg/g) ($p<0.05$). Ether-phosphatidylcholine (PC) content was similar between mud snail (69.15 mg/g) and scallop (64.23 mg/g) ($p>0.05$), but significantly lower in green-lipped mussel (53.69 mg/g) ($p<0.05$). Analysis of two ePL types via phospholipase A1 and HCl treatments revealed that plasmenyl content was higher than plasmanyl content across all samples. In Caco-2 cells, liposomal ePLs tended to show higher intracellular uptake than non-liposomal ePLs, with ether-PE showing higher uptake than ether-PC within the liposomes. This study presents analytical methods for ePLs in aquatic foods and indicates that liposomal ePLs enhance intestinal absorption.

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P3-42

Chlorostyrenes as emerging food contaminants: Toxicity, occurrence, and analytical strategies

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Chlorostyrenes (CSs) are organochlorine contaminants of emerging concern that can be transferred through the food chain via environmental pathways. This review summarizes the sources, toxicity, occurrence, and analytical strategies of mono- and octa-chlorostyrene (OCS), emphasizing their relevance to food safety. MCSs are primarily associated with polymer and resin manufacturing, whereas OCS is unintentionally generated during industrial activities such as waste incineration and chemical production. Toxicological studies have shown that certain MCS isomers exhibit acute and cytotoxic effects, while OCS is characterized by persistence, bioaccumulation and reproductive toxicity. Environmental investigations have reported the presence of OCS in aquatic organisms, wildlife, and human biological samples, indicating its widespread occurrence and potential transfer through the food chain. These findings highlight the need for continued monitoring and reliable analytical methods to support exposure and risk assessments for food safety management.

P3-43

Integrated sensory, metabolite, and antioxidant profiling of tomato accessions using chemometrics

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This study characterized the sensory, physicochemical, and biochemical profiles of five tomato accessions using a chemometric approach. Significant variations were observed in taste- and aroma-related metabolites among accessions. CBNU3 exhibited the highest sweetness and acidity perception, attributed to its elevated fructose and citric acid levels, and showed superior antioxidant capacity correlated with high phenolic content. Pigment profiling revealed distinct accumulation patterns, with CBNU3 being rich in lutein and CBNU2 in lycopene. Volatile analysis identified aldehydes as predominant aroma compounds, while specific esters contributed to the unique flavor of CBNU3. These findings demonstrate that integrated metabolic and sensory profiling provides a robust framework for understanding quality attributes, offering valuable insights for selecting high-quality germplasm in tomato breeding programs.

P3-44

Development of a QuEChERS-GC-MS/MS method for chlorostyrenes and application to food monitoring in Korea

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Chlorostyrenes (CSs) are persistent and bioaccumulative contaminants that may enter the food chain and pose food safety concerns. Therefore, this study developed and validated a QuEChERS–based GC–MS/MS method for the simultaneous determination of five CSs in foods and applied it to a nationwide monitoring survey in Korea. The method was validated according to AOAC guidelines and met all performance criteria, with LOD 0.389 – 0.425 μg/kg and LOQ 0.984 – 1.093 μg/kg. Acceptable accuracy and precision were achieved across representative food matrices, confirming its suitability for trace–level determination of CSs. Most of the CSs detected in the monitoring were present at trace levels between the LOD and LOQ in Korean foods. These findings indicate that current contamination levels of CSs in foods distributed in Korea are generally low. However, given their persistence and bioaccumulative nature, continuous monitoring and further studies are needed to support food safety management. Complementing the recent review published in Food Science and Preservation on the toxicity, analytical methodologies, and occurrence of chlorostyrenes, this study provides validated analytical and occurrence data that improve the understanding of potential dietary exposure to chlorostyrenes in Korea.

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P3-45

Development of an LC-MS/MS method using ultrasound-assisted extraction for the simultaneous quantification of quercetin and related flavonoids in foods

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Quercetin, a flavonol subclass of flavonoids, is widely present in dietary sources such as onions, black tea, broccoli, red wine, and green tea. Owing to its antioxidant, anti-inflammatory, anticancer, and antiviral activities, it has been extensively investigated for potential applications in the medical and pharmaceutical sectors. However, exposure-dependent toxicological concerns should be considered from a food safety perspective. Therefore, the development of a reliable analytical method for the accurate determination of quercetin in food matrices is necessary. In this study, an ultrasound-assisted extraction method coupled with LC-MS/MS was developed and validated for the simultaneous determination of quercetin, luteolin, kaempferol, and apigenin in a broad range of food matrices. The samples were classified by moisture content into high (>66%), medium (33-66%), and low (<33%) categories, and further categorized based on fat, carbohydrate, and protein contents using a modified AOAC food triangle. The method was validated using representative matrices, including radish, garlic, soybean oil, flour, and tofu. The proposed method exhibited excellent linearity, accuracy, and precision for all analytes, while enabling analysis within a total run time of 16 min.

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PART 4 Food Microbiology, Fementation, and Safety

P4-01

Industrial optimization of culture and cryoprotectant conditions for *Lactobacillus brevis* IJRG101010 isolated from the Jinan Plateau

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Lactobacillus brevis IJRG101010, isolated from the Jinan Plateau, shows high saponin tolerance and various enzyme activities. For industrial mass production, optimal culture media and cryoprotectant conditions need to be established. Raw materials must be food-grade, cheap, easy to use, and completely soluble in water to ensure they are mostly removed when harvesting cells by centrifugation. By-products like molasses or soybean meal were excluded because of their unstable supply and quality. Therefore, this study measured viable cell counts using a glucose and yeast extract base mixed with extra nutrients. The optimal medium was determined to be 4% glucose, 0.2% yeast extract, 0.05% $MnSO_4 \cdot H_2O$, 0.1% $MgSO_4 \cdot 7H_2O$, and 0.2% KH_2PO_4 (1.70×1010 CFU/mL). Among the tested cryoprotectants (maltodextrin, trehalose, indigestible maltodextrin, and maltose), maltose showed the highest survival rate. Maltose is about four times cheaper than trehalose, and therefore it is highly practical for industrial use.

P4-02

Quality characteristics and functionality of wines from Georgian wine grape varieties

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This study was conducted to evaluate the enological suitability of Georgian wine grape cultivars for the diversification of domestic wine grape varieties in Korea. The grape cultivars used for winemaking included Goruli mtsvane, Khikhvi, Rkatsiteli, Mtsvane Kakhuri, Budeshuri tetri, Bazaleturi, Beroula, Saperavi, Mamukas sapere, Shavkapito, which were grown in Yeongdong, Chungcheongbuk-do, Korea. To assess their winemaking potential, quality characteristics and functionality of the wines were analyzed. The soluble solids content of the harvested grapes ranged from 13.0 to 20.9 ° Brix. After fermentation, pH values ranged from 3.02 in Bazaleturi wine (lowest) to 3.85 in Mtsvane Kakhuri wine (highest). Total acidity ranged from 0.52 to 1.08%, while soluble solids content ranged from 6.1 to 7.4 ° Brix. Alcohol content and volatile acidity ranged from 10.0 to 13.6% and 0.01%, respectively. In terms of color characteristics, lightness (L*) ranged from 40.44 to 98.53, redness (a*) from 0.09 to 66.50, and yellowness (b*) from 6.38 to 18.13. Hue values ranged from 0.639 to 1.885, and color intensity ranged from 0.266 to 4.020. These results suggest that the evaluated Georgian grape cultivars have potential for contributing to the diversification and development of the domestic wine industry.

P4-03

Functional characterization of lactic acid bacteria strains for potential application in functional foods

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This study evaluated the functional properties of lactic acid bacteria (LAB) strains, *Pediococcus acidilactici* 221560, *Limosilactobacillus fermentum* 221561, and *Lactiplantibacillus plantarum* 221605, isolated from traditional fermented foods in Sunchang, Korea. Freeze-dried bacterial powders were assessed for anti-inflammatory, antioxidant, anti-obesity, and anticancer activities using RAW 264.7 macrophages, 3T3-L1 preadipocytes, and HepG2 and HT-29 cancer cell lines. At 2 mg/mL, strains 221560, 221561, and 221605 inhibited nitric oxide (NO) production by 42.38%, 44.00%, and 44.32%, respectively, compared with 33.15% inhibition in the control (MRS agar). Reactive oxygen species (ROS) production was reduced by 40.20%, 0.31%, and 20.37%, respectively, whereas the control showed 34.44% inhibition. In differentiated 3T3-L1 adipocytes, lipid accumulation rates were 50.90%, 46.93%, and 38.94% for strains 221560, 221561, and 221605, respectively, compared with 48.11% in the control group. Anticancer activity was evaluated at 7 mg/mL. Strains 221560, 221561, and 221605 reduced HepG2 cell viability by 28.27%, 30.34%, and 37.81%, respectively, and HT-29 cell viability by 29.83%, 33.92%, and 17.93%, respectively. These findings indicate that the isolated LAB strains exhibit strain-dependent anti-inflammatory, antioxidant, anti-obesity, and anticancer activities and may serve as potential probiotic candidates for functional food applications

P4-04

Effects of beneficial bacteria and harmful components on the antioxidant and anti-inflammatory activities of traditional Korean *gochujang*

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This study investigated the relationship between beneficial microorganisms and hazardous components in traditional Korean *gochujang* and its antioxidant and anti-inflammatory activities. Freeze-dried gochujang samples were extracted with ethanol, and the extracts were evaluated for their bioactivities. Antioxidant activity was assessed using DPPH radical scavenging activity and oxygen radical absorbance capacity (ORAC), while anti-inflammatory activity was evaluated in RAW 264.7 macrophages by measuring nitric oxide (NO), TNF-α, and IL-1β production. At 10 mg/mL, DPPH radical scavenging activity ranged from 24.76% to 37.30%, with TMG25-65 exhibiting the highest activity. ORAC values reached up to 46.58 mg Trolox equivalents/g sample (mg TE/g), with TMG25-63 showing the highest value. Treatment with gochujang extracts reduced NO production in a concentration-dependent manner, reaching 14.17 - 17.68 μM at 0.4 mg/mL. At the same concentration, TNF-α and IL-1β production ranged from 12.16 to 22.06 ng/mL and 8.00 to 19.07 pg/mL, respectively. These results demonstrate that traditional Korean gochujang possesses antioxidant and anti-inflammatory activities. However, no clear association was observed between these bioactivities and the levels of beneficial microorganisms or hazardous components, suggesting that other constituents may contribute to the functional properties of *gochujang*.

P4-05

Development of antioxidant and antidiabetic fermented paprika products through fermentation with lactic acid bacteria

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Paprika (*Capsicum annuum*) is one of the most widely consumed vegetables worldwide and is utilized as both a fresh and processed food due to its diverse colors and rich functional components. Recently, the development of high value-added foods through the combination of natural functional materials and lactic acid bacteria fermentation has attracted increasing attention. In this study, various lactic acid bacteria were cultured in paprika fruit and leaf extracts to develop fermented paprika materials with enhanced functionality and sensory quality. The physicochemical properties of the fermented broths, as well as total polyphenol contents, antioxidant activities, and antidiabetic activities, were evaluated. Among the tested microorganisms, *Leuconostoc citreum* KM20, *Lactobacillus casei* ATCC 334, and *Lactobacillus sakei* AGO-2 produced fermented broths with superior antioxidant, antidiabetic, and sensory properties compared with non-fermented extracts. In contrast, fermentation with *Bacillus amyloliquefaciens* KCTC 13012 resulted in lower sensory acceptability but showed strong antioxidant and antidiabetic activities. These findings suggest that fermentation of paprika fruits and leaves using lactic acid bacteria and Bacillus strains can produce high value-added functional foods. In particular, fermented paprika beverages with enhanced antioxidant and antidiabetic activities may be developed using selected lactic acid bacteria.

P4-06

Isolation and characterization of *Pseudomonas silesiensis* ANU-5 with efficient indole degradation

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Livestock manure generates various odor-causing compounds, including indole and skatole, which are major contributors to offensive livestock odors. In this study, indole-degrading microorganisms were isolated from swine manure, and the physiological and biochemical characteristics of the selected strain were investigated. A total of 48 isolates were screened using MSM medium containing indole or skatole as the sole carbon source and evaluated by DMAB assay. Among them, isolate ANU-5 showed reproducible indole degradation activity and was identified as Pseudomonas silesiensis ANU-5 by 16S rRNA sequencing. The strain showed favorable growth under aerobic conditions at pH 7 and 15-20℃ and tolerated indole concentrations up to 250 ppm. API-ZYM analysis revealed several enzymatic activities related to aromatic compound metabolism, and PCR analysis confirmed the presence of putative indole degradation-related genes, including iacA, styA, and pcaG. HPLC analysis demonstrated a marked reduction of the indole peak in ANU-5-inoculated samples, while GC-MS analysis detected various metabolites generated during indole transformation. Based on metabolite profiles, a possible indole biotransformation pathway was proposed. These results suggest that Pseudomonas silesiensis ANU-5 has potential as a microbial resource for reducing livestock manure odor through biological indole degradation.

P4-07

Effect of acid pre-exposure history on high-pressure processing efficacy against *Escherichia coli* O157:H7 in juice matrices

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Although acid stress is known to alter the physiological state of foodborne pathogens, its impact on susceptibility to high-pressure processing (HPP) remains poorly understood. This study investigated the effect of acid pre-exposure on the HPP susceptibility of *Escherichia coli* O157:H7. Cells pre-exposed to pH 4 in tryptic soy broth for 24 h showed greater inactivation after HPP than those exposed to pH 6, regardless of strain or pre-exposure temperature (5 and 25℃). Mechanistic analyses showed that increased HPP susceptibility of acid-pre-exposed cells was associated with membrane damage, oxidative stress, metabolic impairment, altered fatty acid composition, and upregulation of stress-related genes. To validate these findings in food matrices, *E. coli* O157:H7 was inoculated into apple, tomato, and ABC (apple – beet – carrot) juices adjusted to pH 4 and stored at 5℃ for 24 h prior to HPP treatment. Juice samples stored for 24 h before HPP exhibited greater pathogen inactivation than samples treated immediately after inoculation. These findings demonstrate that acid exposure history significantly influences HPP-induced pathogen inactivation, suggesting that acid pre-exposure may enhance HPP efficacy and inform HPP conditions for acidic beverage products.

P4-08

AI-assisted MALDI-TOF MS for accurate discrimination of *Vibrio harveyi* clade species in seafood safety monitoring

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Accurate discrimination of *Vibrio harveyi* clade species is challenging in seafood safety monitoring because closely related species show overlapping phenotypic and MALDI-TOF MS profiles. This study evaluated an AI-assisted MALDI-TOF MS approach for classifying V. harveyi clade species. A total of 235 PCR-confirmed Vibrio strains were analyzed, generating 1,082 spectra. Six machine-learning classifiers were trained using independent test sets and cross-validation. Commercial database identification correctly classified 187 of 235 strains, with 79.57% accuracy and misidentified all *V. campbellii* strains. Machine-learning models markedly improved performance. Random forest achieved 100% accuracy, precision, recall, and F1 score on independent test sets, with a cross-validation F1 score of 0.998. Gradient boosting, k-nearest neighbors, and support vector machine models also performed nearly perfectly. Although PCA using all spectral features showed species overlap, the top 10% random forest-selected features produced species separation. Key discriminatory peaks were identified at 7,194.7, 3,609.8, and 9,179.6 m/z. These findings demonstrate that AI-assisted MALDI-TOF MS enables rapid, database-independent identification of *V. harveyi* clade species for seafood safety monitoring.

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P4-09

Monitoring of *Escherichia coli* contamination in retail meat

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The presence of antimicrobial-resistant pathogenic *Escherichia coli* in retail meat may increase the risk of human exposure through food consumption. This study investigated the prevalence of E. coli and pathogenic *E. coli* in retail meat and evaluated the antimicrobial resistance of the isolates. A total of 400 retail samples (120 beef, 120 pork, 120 chicken, and 40 eggs) were collected in South Korea. Samples were analyzed for *E. coli* counts, screened for pathogenic *E. coli* virulence genes by PCR, and tested for susceptibility to 17 antibiotics using Vitek2. *E. coli* was detected in 37.5% of beef, 35.0% of pork, and 76.7% of chicken samples, with mean counts of approximately 2 Log CFU/g, which were within recommended limits. No *E. coli* was detected in eggs. Virulence genes associated with pathogenic *E. coli* were detected in 11.7% of beef, 4.2% of pork, and 69.2% of chicken samples. Eighteen enteropathogenic *E. coli* isolates from chicken exhibited multidrug resistance to three or more antimicrobial classes. All isolates were resistant to nalidixic acid. These findings indicate that retail chicken meat is a major reservoir of pathogenic and multidrug-resistant *E. coli*, highlighting the importance of proper food handling and adequate cooking to reduce potential public health risks.

P4-10

Effects of production systems on microbial communities and fatty acid profiles in raw milk

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Raw milk composition and microbiota are influenced by production practices, affecting milk quality and nutritional value. This study compared microbial communities, fatty acid profiles, and their associations in conventional, antibiotic-free, and organic raw milk collected during winter in South Korea. Total bacterial counts, somatic cell counts, microbiota, and fatty acids were analyzed using culture-based methods, metagenomic sequencing, and multivariate statistics. Total bacterial counts did not differ among milk types, whereas somatic cell counts were higher in organic milk. Microbial diversity and overall community structure were similar among groups, with Pseudomonas dominant in all samples. Organic milk had higher relative abundances of *Lactococcus*, *Acinetobacter*, and *Carnobacterium*. Fatty acid composition differed by production system, and organic milk contained higher levels of polyunsaturated fatty acids, including C18:2n-6, C18:3n-3, and C20:4n-6. Correlation and network analyses showed positive associations between these fatty acids and microbial genera enriched in organic milk. These findings indicate that production systems affect specific microbial populations and fatty acid composition, providing insight into raw milk quality and nutritional characteristics.

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P4-11

AI-guided development of a microfluidic chip-based on-site PCR platform for detection of *Salmonella* in eggs

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Rapid and accurate detection of *Salmonella* in eggs is essential for preventing foodborne outbreaks and improving on-site food safety monitoring. In this study, we developed an on-site PCR platform for simultaneous detection of *Salmonella* spp. and three epidemiologically important serovars, *Typhimurium*, *Enteritidis*, and *Thompson*, in egg samples. Candidate genetic markers were identified using an AI-assisted bioinformatics approach and selected based on target specificity. The markers were integrated into a microfluidic chip-based PCR system combined with simplified DNA preparation, enabling field-applicable detection without conventional laboratory equipment. The assay was optimized using pure cultures and artificially contaminated egg samples. The developed method specifically detected *Salmonella* spp. and the three target serovars without cross-reactivity against non-target strains. In spiked egg samples, the microfluidic chip-based on-site PCR showed stable amplification and high sensitivity. After short enrichment, low-level contamination could be detected, demonstrating practical applicability for field screening. This AI-guided marker discovery and microfluidic chip-based PCR system provides a portable strategy for on-site detection and serotyping of *Salmonella* in eggs.

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P4-12

Quality characteristics and physiological activities of vinegars produced from different fig cultivars using *Acetobacter pasteurianus SC08*

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This study was conducted to compare the quality characteristics and physiological activities of vinegars produced from three fig cultivars ('Dauphine', 'Banane', and 'Jimnika'). Fig vinegars were prepared by acetic acid fermentation using *Acetobacter pasteurianus* SC08, and their total phenolic content (TPC), total flavonoid content (TFC), antioxidant activities (DPPH and ABTS radical scavenging activities), α-glucosidase inhibitory (AGI) activity, and antimicrobial activity were evaluated. TPC was highest in Dauphine vinegar (28.17 mg GAE /100 mL), followed by Banane (24.36 mg GAE /100 mL) and Jimnika (17.93 mg GAE/100 mL), while TFC was highest in Dauphine (8.97 mg RE/100 mL), followed by Jimnika (7.30 mg RE/100 mL) and Banane (4.90 mg RE/100 mL). Antioxidant activities determined by DPPH and ABTS assays showed similar trends, with Dauphine vinegar exhibiting the strongest radical scavenging activity. AGI activity was also highest in Dauphine vinegar. Antimicrobial activity increased after acetic acid fermentation, showing strong inhibitory effects against Escherichia coli and Bacillus cereus, whereas no activity was observed against Staphylococcus aureus and Listeria monocytogenes. These results suggest that Dauphine-derived vinegar possesses superior physiological activities and has considerable potential as a functional fermented food ingredient.

P4-13

Inhibitory effects of ou-gon (*Scutellaria* root) extracts against *kimchi* film-forming yeasts

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Film-formation during kimchi storage is a major quality defect that reduces appearance, flavor, and consumer acceptability. This study evaluated the inhibitory effects of ou-gon (*Scutellaria* root) extract against film-forming yeasts and identified an effective extraction condition and concentration. A commercial ou-gon extract and four laboratory-prepared ou-gon extracts were tested against six yeast species isolated from *kimchi*: *Candida sake*, *Kazachstania servazzii*, *K. barnettii*, *Debaryomyces hansenii*, *Pichia kudriavzevii*, *Tausonia pullulans*. Initial screening showed strain-dependent inhibition and the highest anti-yeast activity in the acetic acid extract, which was selected for MIC testing at 20% to 0.3125% to determine strain-specific MIC values. MIC results showed that T. pullulans was inhibited at 5%, *C. sake* and *D. hansenii* were inhibited at 10%, and *K. servazzii* and *K. barnettii* were inhibited at 20%, whereas *P. kudriavzevii* showed no clear inhibition within the tested concentration range. These results suggest that acetic acid extract of ou-gon may help control kimchi pellicle-forming yeasts. Further studies should verify its efficacy and effects on *kimchi* quality under application conditions.

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P4-14

Storage stability of *Eucommia ulmoides*-derived nanovesicles and their osteogenic

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Plant-derived nanovesicles are natural nanoparticles with potential applications as functional bioactive materials. This study evaluated the storage stability, cytotoxicity, and osteogenic activity of *Eucommia ulmoides*-derived nanovesicles under different storage conditions. Nanovesicles were isolated by ultracentrifugation, and some samples were lyophilized after tangential flow filtration. The samples were stored at −80℃, −20℃, 4℃, and room temperature for 1 week, 1 month, and 6 months. Particle properties and protein concentration were analyzed using nanoparticle tracking analysis and protein assay. Cytotoxicity and osteogenic activity were evaluated in MC3T3-E1 cells using MTT assay and Alizarin Red S staining. Room temperature storage maintained osteogenic activity up to 1 month, but the activity decreased after 6 months. The −80℃ condition showed the most stable activity during long-term storage. In the MTT assay, cell viability was maintained up to 1 month, whereas high-dose treatment after 6 months reduced viability in several groups, except for the −20℃ condition. These results suggest that room temperature storage may be suitable for short-term use, while −80℃ storage is more appropriate for long-term preservation of Eucommia ulmoides-derived nanovesicles.

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P4-15

압타머 및 ConA-자성비드를 이용한 타액 기반 노로바이러스 신속 비색 검출 기술 개발

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노로바이러스(HuNoV)는 집단 식중독의 주요 원인 바이러스로, 기존 RT-qPCR 방식의 한계를 극복할 현장형 신속 선별 기술이 요구된다. 본 연구에서는 타액을 이용한 비침습적 HuNoV 신속 비색 검출 플랫폼을 개발하였다. 먼저 GII.4 VP1 단백질에 높은 친화도를 가진 Beier 압타머를 표적 분자로 선정하고, Concanavalin A (ConA) 자성비드 기반의 포획·농축 시스템을 구축하였다. 전처리 조건 최적화 결과, EDTA 처리 후 mannose를 용출액으로 적용했을 때 VP1 회수율은 88.0%였으며, 실제 타액 환경에서도 89%의 높은 효율을 유지하였다. 검출부에서는 압타머-금 나노입자(AuNP)를 도입하여 표적 결합에 따른 응집 유도 비색 특성을 평가하였다. VP1 농도가 증가할수록 520 nm 흡광도(⊿A520)가 농도 의존적으로 증가하여 농도에 따른 비색 검출이 가능함을 확인하였다. 본 연구는 가글형 타액 검체 기반의 전처리-검출 통합 플랫폼의 실현 가능성을 제시하였으며, 향후 학교, 급식 및 식품 제조 현장용 신속 선별 키트(NoroQuick™) 제품화에 기여할 것으로 기대된다.

P4-16

Optimization of bioactive material development from the red seaweed Gloiopeltis tenax using microbial bioconversion

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Gloiopeltis tenax (GT), a member of the Endocladiaceae family, is an economically important marine resource in East Asia, traditionally utilized as an adhesive and edible material. This study evaluated preprocessing conditions, including blanching, for the effective utilization of GT as a raw material and optimized extraction and microbial bioconversion processes to develop bioactive materials. No significant difference in weight change was observed during blanching regardless of tap water soaking. Comparative analysis of extraction solvents revealed that hot water extraction yielded a higher solid content than 30% ethanol extraction. In addition, HPLC-based pattern analysis of ethyl acetate fractions from dried samples before and after bioconversion showed a noticeable increase in specific peaks following the process. These results highlight the necessity for further identification of the corresponding compounds and the establishment of marker substances. Moreover, formulation studies demonstrated that the dried bioactive material was soluble in water at concentrations up to 0.5%. Collectively, these results suggest that GT-derived materials hold promise as functional ingredients for applications in food and medi-food industries.

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P4-17

Comparative analysis of physicochemical characteristics of apple vinegars based on raw materials, manufacturing processes, and fermentation environments

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This study investigated the effects of raw materials, manufacturing processes, and fermentation environments on the physicochemical characteristics of apple vinegars to develop quality standardization indicators. Apple vinegars produced from apples and apple juice were collected from Jeollabuk-do (JA) and Gyeongsangbuk-do (CA), respectively. The manufacturing environments were generally similar, except that JA was fermented at 30 – 35℃, whereas CA was fermented at ambient temperature. Acetic acid fermentation was conducted for 20 days, and samples were analyzed every 10 days. Total acidity increased 1.4- to 4.8-fold during fermentation. Acetic acid and malic acid were the major organic acids identified. Free amino acid contents showed different trends between samples. In JA, free amino acids decreased due to microbial utilization during rapid fermentation, whereas CA showed an increase in total free amino acids. Notably, glycine, alanine, valine, and γ-aminobutyric acid (GABA) increased 7- to 20-fold. Volatile compound analysis revealed decreased ethanol and increased acetic acid during fermentation. These findings provide valuable information for establishing quality standardization indicators and optimizing fermentation processes for high-quality apple vinegar production.

P4-18

어린이집 급식실 에어컨필터의 미생물 오염도 조사

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어린이집 급식소는 면역력이 취약한 영유아가 매일 이용하는 공간으로 에어컨 필터에 식중독세균이 오염되면 급식 안전에 중대한 문제를 야기할 수 있다. 본 연구는 전남 일부 지역 어린이집 급식소 77곳의 에어컨 필터를 채취하여 일반세균수, 대장균군, 식중독균 8종을 분석하고, 시설 유형, 원아 수, 에어컨 종류, 청소 주기에 따른 미생물 오염도를 비교하였다. 일반세균수는 시설 유형에 따라 유의한 차이를 보였으며($p<0.05$), 가정어린이집에서 가장 높은 오염도가 나타났다. 대장균군은 전 시료에서 불검출되었으며, 식중독균은 1개 시료(1.3%)에서 *Bacillus cereus*가 검출되었다. 이러한 결과를 종합하여 볼 때, 어린이집 급식소 에어컨 필터의 미생물학적 안전성은 확보된 것으로 판단된다. 그러나 이러한 결과는 조사 시기가 에어컨 비가동 시기에 시료를 채취하였기 때문인 것으로 판단된다. 따라서 향후 에어컨 가동 중 미생물 오염도 분석이 필요한 것으로 판단된다.

P4-19

난각 번호 및 보관 방법에 따른 미생물 오염도 평가

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계란은 전 세계적으로 다 소비되는 동물성 식품이다. 하지만 난각 표면 오염에 의한 미생물학적 위해 가능성이 지속적으로 제기되고 있다. 본 연구에서는 국내 시중에 유통되는 계란 표면의 미생물 오염도를 평가하고자 하였다. 시료는 난각 번호와 보관 온도를 구분하여 구매하였으며, 미생물실험은 식품공전 미생물 실험법에 따랐다. 실험 결과, 일반세균수는 냉장 보관 계란(log 2.26 CFU/g)이 실온 보관 계란(log 1.58 CFU/g)보다 높게 나타났으며, 대장균군은 냉장 보관(log 1.08 CFU/g)이 실온 보관(log 0.28 CFU/g)보다 높게 검출되었다. 난각 번호별로는 일반세균수가 난각 번호 4번(log 2.39 CFU/g), 3번(log 1.71 CFU/g), 2번(log 1.21 CFU/g) 순으로 낮았으며, 대장균군도 동일하게 낮게 나타났다. 살모넬라 및 식중독균은 전체 시료에서 검출되지 않았다. 본 연구 결과, 난각 번호가 높을수록 일반세균수 오염도가 높아지는 경향이 확인되었으며, 보관 온도별로는 냉장 보관 계란의 일반세균수 및 대장균군이 실온 보관보다 높게 나타났다. 이러한 결과로 보아 계란의 사육 환경 및 유통 온도 관리가 난각 위생에 중요한 요인으로 판단된다.

P4-20

Effects of rice type and particle size on brewing characteristics of Baromi2 floury rice

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Baromi2 is a floury rice cultivar suitable for dry milling and brewing applications. This study investigated the effects of rice type and particle size on the brewing characteristics of Baromi2 rice. White and brown rice samples were prepared as whole grain, crushed rice, and rice flour. Saccharified rice extracts were blended with malt wort and fermented using *Saccharomyces cerevisiae* at 20℃. Fermentation progress was monitored by daily CO_2 loss, and alcohol content and free sugar composition were analyzed after fermentation. Glucose content before fermentation increased from 27,963 to 49,356 ppm in white rice and from 11,383 to 35,011 ppm in brown rice as particle size decreased. Maltose content also increased with decreasing particle size. In both rice types, cumulative CO_2 loss and alcohol content increased as particle size decreased. Cumulative CO_2 loss increased from 63.2 to 77.2 g in white rice and from 51.2 to 73.5 g in brown rice, while alcohol content increased from 3.93 to 5.14% (v/v) and from 3.22 to 4.71% (v/v), respectively. These findings indicate that reducing particle size improves sugar availability and fermentation performance, suggesting that finely milled Baromi2 rice can be effectively utilized as a rice adjunct in beer brewing.

P4-21

Antioxidant activity and phenolic profiles of low-iodine fermented *doenjang*

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Doenjang, a traditional Korean fermented soybean paste, is widely consumed for its nutritional and functional properties. However, its iodine content may vary with raw materials and processing conditions. Since iodine restriction is required in certain clinical situations, iodine-controlled doenjang may be useful as a customized care-food ingredient. This study evaluated the antioxidant properties of low-iodine fermented doenjang. Low-iodine doenjang was prepared by immersing meju fermented with Sunchang Hwangguk No. 1 in 15% brine containing iodine-reduced refined salt for 14 days, followed by mixing with roasted germinated soybean and barley powders and fermentation at 20-25℃ for 7 days. Antioxidant activity was assessed using DPPH and ABTS assays, and total flavonoid and phenolic contents were determined by spectrophotometric methods. DPPH activity was 31.58±7.32% in the control and 26.14±6.07% in low-iodine doenjang. In contrast, ABTS activity was higher in low-iodine doenjang (44.68±7.77%) than in the control (34.90±8.83%). These results indicate that low-iodine doenjang showed assay-dependent antioxidant activity, with enhanced ABTS capacity despite lower DPPH activity. Therefore, low-iodine fermented *doenjang* may have potential as a customized care-food ingredient.

P4-22

Evaluation of fermented fruit extract B as an eco-friendly antibacterial material against *Xanthomonas campestris* pv. *campestris*

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Xanthomonas campestris pv. *campestris* is a major plant pathogenic bacterium that causes black rot in Brassica crops. In this study, several candidate materials, including plant extracts and fermented fruit extracts, were screened to identify an eco-friendly antibacterial material. Among the tested substances, fermented fruit extract B exhibited the highest antibacterial activity in a disc diffusion assay and was selected for further investigation. Its antibacterial activity was further confirmed by treatment at various concentrations and comparison with a commercial bactericide used as a positive control. In addition, bacterial growth inhibition curves based on absorbance at 600nm demonstrated that the extract effectively suppressed bacterial growth at concentrations of 2.5 μL/mL or higher. Furthermore, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) assays performed according to the CLSI standard protocol revealed bacteriostatic activity at a 2-7 dilution and bactericidal activity at a 2-6 dilution. These results suggest that fermented fruit extract B has potential as an eco-friendly material for the control of plant bacterial diseases.

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P4-23

Antibacterial activity of fermented fruit extract B against *Acidovorax citrulli*

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Bacterial fruit blotch caused by *Acidovorax citrulli* is a serious disease of cucurbit crops, requiring eco-friendly control materials. In this study, fermented fruit extract B was evaluated for its antibacterial efficacy against *A. citrulli* and its potential as a natural biopesticide resource. In the disc diffusion assay, the extract showed the highest antibacterial activity among the tested materials, producing a 15.3 mm inhibition zone. Its activity was compared with commercial bactericides using serial dilutions. Although the undiluted extract was less active than Sungbo Cycline, it showed stronger activity than Agromycin, and its inhibitory effect decreased with dilution. In liquid culture, bacterial growth was suppressed in a concentration-dependent manner, with complete inhibition observed at 5 μL/mL or higher. At the MIC of a 2^{-7} dilution, bacterial growth was inhibited, as indicated by a reduced increase in absorbance, whereas no colony formation was observed at the MBC of a 2^{-6} dilution, demonstrating bactericidal activity. These findings suggest that fermented fruit extract B has potential as an eco-friendly antibacterial agent for the management of *A. citrulli* in cucurbit crops.

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P4-24

Phyllodulcin 생산을 위한 Pentopan 500BG 유래 β-glucosidase의 정제 및 생화학적 특성 분석

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수국(*Hydrangea macrophylla*)잎에는 설탕의 400배 이상의 단맛을 내는 phyllodulcin이 배당체 형태로 존재하며, 대사 과정 중 phyllodulcin으로 전환된다. 본 연구에서는 상업효소를 이용하여 phyllodulcin glucoside로부터 phyllodulcin을 생산하고자 하였다. 총 25종의 상업효소 스크리닝 결과, Pentopan 500BG에서 β-glucosidase 활성이 확인되었으며, Pentopan 500BG 유래 β-glucosidase (PBG)의 분자량은 약 43 kDa, 비활성은 7.06 U/mg이었다. 최적 pH는 5.5였고, 50–70℃ 조건에서 18시간 동안 50% 이상의 활성을 유지하였다. PBG는 phyllodulcin glucoside에 대해 가장 높은 촉매 효율을 나타냈으며, kcat/Km 값은 216.68 s^{-1}·mM^{-1}로 다른 기질들에 비해 10–40배 높게 나타났다. 효소반응 6시간에서 phyllodulcin 함량이 최대에 도달하였다. 이를 통해 PBG가 phyllodulcin glucoside를 phyllodulcin으로 전환할 수 있음을 확인하였으며, phyllodulcin 생산에 활용 가능성이 있음을 시사한다.

P4-25

Metabolite-spectral associations and machine learning for hyperspectral detection of microbial contamination in red pepper powder

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Microbial contamination of red pepper powder poses a significant food safety concern in kimchi production and remains difficult to detect using conventional microbiological methods. This study investigated the feasibility of hyperspectral imaging (HSI) for rapid and non-destructive detection of microbial contamination in red pepper powder inoculated with *Escherichia coli* and *Staphylococcus aureus*. Spectral changes were monitored during storage and interpreted through microbiological, metabolomic, and structural analyses. Distinct contamination-dependent spectral variations were observed, particularly within wavelength regions associated with O-H, C-H, and N-H vibrations. Metabolomic profiling demonstrated significant alterations in amino acids, organic acids, and carbohydrates, which were strongly associated with characteristic spectral responses. UVE-SPA selected informative wavelengths that substantially improved model performance. Among the evaluated models, XGBoost, RF, and Light GBM achieved excellent classification accuracy for both bacterial species. These findings demonstrate that HSI combined with metabolite informed spectral interpretation and machine learning provides an effective tool for rapid microbial safety monitoring of powdered agricultural products.

P4-26

내열성 당전이 효소를 활용한 신규 파노스 타입 올리고당 제조 및 소화특성 평가

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최근 혈당 조절 및 장 건강에 대한 관심이 증가하면서 난소화성 탄수화물 소재 개발의 필요성이 커지고 있다. 기존 전분계 글루코올리고당은 주로 α-1,4 및 α-1,6 결합으로 구성되어 인체 내 소화효소에 의해 쉽게 분해될 수 있다. 따라서 α-1,2, β-1,4 및 β-1,6 결합 등 비전형적 글리코시드 결합을 포함하는 당질 구조의 설계가 필요하다. 본 연구에서는 kojibiose, palatinose, cellobiose 및 gentiobiose를 이용하여, Thermoanaerobacter thermocopriae 유래 α-1,6-transglucosidase (TtTG)를 통한 신규 파노스 타입 올리고당을 제조하였다. 각각 DP3 및 DP4 올리고당을 분리하여 NMR로 구조를 동정하고, 포유류 유래의 α-glucosidase를 처리하여 소화율을 평가하였다. 소화율은 cellobiose를 수용체로 하여 생성된 올리고당이 가장 낮았고 palatinose, gentiobiose, kojibiose를 수용체로 하여 생성된 올리고당 순으로 높아졌다. 따라서 수용체 이당류의 결합 구조와 중합도가 효소적 전이반응으로 생성된 올리고당의 소화율 조절에 중요한 요인임을 확인하였다.

P4-27

Caffeoyl-CoA O-methyltransferase를 활용한 O-methyl EGCGs의 생산

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Epigallocatechin gallate (EGCG)는 녹차(*Camellia sinensis*)의 주요 생리활성 물질이다. 하지만, 구조적으로 B링 및 갈로일기에 반응성이 높은 페놀성 수산기를 다수 보유하고 있어, 환경 변화에 따라 쉽게 산화 및 중합체를 형성하여 갈변과 활성 저하를 유발하는 불안정성이 있다. 본 연구에서는, 이러한 불안정성을 개선하기 위해 Caffeoyl-CoA O-methyltransferase를 활용하여 EGCG의 수산기에 S-adenosyl-L-methionine으로 부터 공여된 메틸기를 전이하는 반응을 수행하였다. 효소 반응은 37℃에서 3시간 동안 진행하였고, HPLC-UV 및 LC-MS를 통해 메틸화 유도체들을 동정하였다. 분석 결과, mono-, di-, tri-, tetra 형태의 메틸화 유도체들이 생성되었고, 그 중 mono-와 di-methyl 유도체가 주요 생성물로 확인되었다. 주요 유도체의 산화 안정성 및 갈변 억제 활성을 평가하였을 때, 메틸화는 외부 환경(열, 빛, pH 등)에 대한 EGCG의 저항성을 향상시키는 것으로 나타났다. 이는 메틸화가 EGCG의 산화 안정성을 높이는 효과적인 수단임을 시사하며, 추후 메틸화 정도의 제어를 통해 EGCG의 기능성과 안정성을 확보한 소재로서 활용될 것으로 전망된다.

P4-28

용해도 및 안정성이 향상된 신규 레바우디오사이드 M 유도체의 합성 및 특성 분석

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레바우디오사이드 M은 설탕과 유사한 감미 프로필을 가진 우수한 천연 감미료이지만, 낮은 용해도로 인해 산업적 활용에 제한을 겪어왔다. 본 연구에서는 덱스트란수크라제와 UDP-글루코실트랜스퍼라제를 이용하여 레바우디오사이드 D 유사 화합물로부터 4종의 신규 유도체(RM1 – RM4)를 합성하였다. 합성된 유도체들의 구조는 LC-MS 및 NMR 분석을 통해 확인되었다. 이들 유도체는 가열 및 산알칼리 조건에서 스테비오사이드와 동등하거나 우수한 안정성을 나타냈다. 특히 용해도 측면에서 가장 괄목할 만한 개선을 보였는데, RM1, RM2, RM3, RM4의 용해도는 기존 RM 대비 각각 140배, 125배, 71배, 80배 증가하였다. 또한, 인비트로(*in vitro*) 소화 분석 결과, 수식 스테비아에 비해 포도당 방출량이 유의미하게 낮아 대사적 이점이 있음을 시사했다. 본 연구를 통해 개발된 배당체들은 안정성을 향상시키는 동시에 용해도의 한계를 극복함으로써, 높은 상업적 잠재력을 지닌 이상적인 차세대 감미료가 될 것으로 기대된다. 본 연구 결과는 RM 유도체를 다양한 식품 및 음료 시스템에 적용할 수 있는 확실한 기반을 제공하며, 기존 감미료를 대체할 수 있는 우수한 대안을 제시한다.

P4-29

Raw material and quality profiles of award-winning *makgeolli* from the Korea Sool Award

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This study aimed to characterize the raw material composition and quality profiles of award-winning makgeolli products from the Korea Sool Award between 2019 and 2025, and to explore differences in organic acid profiles between low- and high-alcohol *makgeolli* awardees from 2024 to 2025. A total of 27 *makgeolli* award cases were analyzed, and raw materials were classified into starchy materials, saccharifying agents, yeast, and adjunct ingredients. Among the starchy material types, non-glutinous rice alone was the most frequent formulation, accounting for 15 cases (55.6%), followed by the combination of non-glutinous and glutinous rice in 6 cases (22.2%) and glutinous rice alone in 3 cases (11.1%). Traditional *nuruk* was the predominant saccharifying agent and was included in 21 cases (77.8%). In the 2024–2025 samples, organic acid profiles differed between low- and high-alcohol makgeolli. The high-alcohol group showed a higher mean lactic acid concentration (662.6 mg/100 mL) than the low-alcohol group (381.5 mg/100 mL), corresponding to an approximately 1.7-fold difference. Acetic acid was also higher in the high-alcohol group (86.5 mg/100 mL) than in the low-alcohol group (65.8 mg/100 mL), showing an approximately 1.3-fold difference. In contrast, citric acid was higher in the low-alcohol group (114.8 mg/100 mL) than in the high-alcohol group (51.5 mg/100 mL). However, because major raw materials were largely similar among the samples, these organic acid differences could not be directly attributed to specific raw material factors. These results provide exploratory baseline information on the raw material composition and quality characteristics of recent award-winning *makgeolli* products.

P4-30

내열성 당전이 효소를 이용한 수용성 및 안정성이 향상된 신규 저칼로리 감미료 합성

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Rebaudioside A (RA)는 식품산업에 널리 사용되는 천연감미료이나, 낮은 수용성으로 실제 적용에는 한계가 있다. 본 연구에서는 이를 극복하고자 *Thermoanaerobacter thermocopriae* 유래 내열성 당전이 효소(TtTG)를 이용한 신규 생물전환을 통해 소재변형을 구축하였다. 반응표면분석법으로 효소 반응시간(1–5 h), 수용체 농도(10–50 mM), 효소활성(0.5–1.5 mU) 등의 영향을 평가하고 조건을 최적화하였다. 최적 생산 조건에서 RA의 C–13 위치에 포도당이 결합한 새로운 α–1,6–글루코실 RA 유도체인 rebaudioside L α–1 (Reb L α–1) 및 rebaudioside L α–2 (Reb L α–2)를 합성하고, LC–MS와 NMR 분석을 통해 구조를 규명하였다. 이 유도체들은 당 결합 위치에 따라 수용성이 변화하였는데, 포도당의 C–2 위치에 당전이 된 Reb L α–2가 RA 대비 가장 높은 수용해도(144.9배)를 나타냈다. 또한 두 유도체 모두 향상된 산 안정성(pH 2.0에서 RA 대비 5–10% 잔존)과 열 안정성(120℃에서 93% 이상 잔존)을 보였다. 본 결과는 TtTG를 이용한 당전이 반응이 수용성과 가공 안정성이 개선된 감미료를 생산할 수 있는 효과적인 전략임을 입증한다.

P4-31

Effects of acid treatment on bacterial control and quality characteristics of commercial *nuruk*

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This study investigated the optimal acid-treatment conditions for bacterial control in commercial nuruk and evaluated the associated changes in quality characteristics. Four commercial fermentation starters, including three *nuruk* products and one crude enzyme preparation, were used in this study. To determine the effects of acid addition, samples were treated at different pH levels (2.5, 3.5, and 4.5) and treatment times (30 min, 1 h, and 2 h). Among the tested conditions, treatment at pH 2.5 for 2 h showed the greatest bacterial reduction, while changes in enzyme activity were relatively limited. The initial bacterial counts of 10^4–10^8 CFU/g, significantly decreased to 10^2–10^6 CFU/g following treatment. The saccharogenic power was maintained at 0.34 to 38.81 U/mL after 30 min, 0.42 to 40.45 U/mL after 1 h, and 0.50 to 41.95 U/mL after 2 h, indicating stably preserved enzyme activity. The bacterial reduction rate reached 40.0–72.1% after 30min and further intensified, leaving only 1.5–10% of the initial population after 2 h. These results suggest that acid treatment at pH 2.5 for 2 h is an effective approach for reducing bacterial contamination in commercial nuruk without substantial deterioration of enzymatic quality. Therefore, this study provides basic data for developing bacterial control technologies to prevent quality deterioration in makgeolli fermentation using commercial nuruk.

P4-32

Genome-linked phenotypic characterization of vinegar-derived acetic acid bacterium CHR1 reveals acetic acid production, stress adaptation, and biofunctional potential

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Acetic acid bacteria are key microorganisms in vinegar fermentation because they oxidize ethanol to acetic acid under acidic and ethanol-rich conditions. In this study, strain CHR1 was isolated from brown rice vinegar produced in Hongseong, Korea, and characterized using phenotypic assays and whole-genome analysis. Genome-based taxonomic analysis showed that CHR1 was closely related to *Acetobacter oryzoeni* B6, with 98.0% average nucleotide identity and 83.9% digital DNA–DNA hybridization. Pan-genome presence/absence analysis further indicated close accessory-genome similarity to *A. pasteurianus*-related genomes within the *A. oryzoeni*/pasteurianus lineage. CHR1 produced 9.4% acidity under 10% ethanol and grew well at pH 3.34 and 30℃, indicating strong acid-producing capacity and adaptation to acidic fermentation conditions. Genome annotation identified genes related to alcohol and aldehyde oxidation, pyrroloquinoline quinone (PQQ) biosynthesis, respiratory-chain function, ATP synthesis, Na^+/H^+ antiport, organic acid efflux, chaperone activity, and oxidative stress defense. These genomic features were consistent with the observed ethanol tolerance, acid adaptation, and acetic acid production. CHR1 also exhibited multiple in vitro bioactivities, including antimicrobial, antioxidant, antihypertensive, antidiabetic, immunomodulatory, and anti-inflammatory activities. Overall, CHR1 represents a promising vinegar-derived acetic acid bacterium with high acid-producing capacity, stress adaptation traits, and potential as a starter culture candidate for vinegar fermentation.

P4-33

Whole-genome and fermentation evidence supporting *Leuconostoc lactis* K2-11 for controlled *kimchi* fermentation

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This study evaluated *kimchi*-derived *Leuconostoc lactis* K2-11 as a potential starter culture by integrating genome annotation with fermentation phenotype analysis. Comparative genomics revealed that K2-11 possesses the genetic capacity for phosphoketolase-dependent heterolactic fermentation, including genes encoding xylulose-5-phosphate phosphoketolase (xpkA), lactate dehydrogenases, xylulose-5-phosphate phosphoketolase (pta/ackA), and alcohol/aldehyde dehydrogenases. The genome also contained genes associated with sugar utilization, exopolysaccharide biosynthesis, plant-derived carbohydrate metabolism, malolactic conversion, flavor formation, and tolerance to acid, cold, and osmotic stresses, suggesting functional adaptation to the kimchi fermentation environment. Fermentation assays showed significant effects ($p < 0.05$) of strain, fermentation time, and interaction on viable cell counts, pH, and titratable acidity. K2-11 rapidly acidified kimchi, reducing pH from 5.22 to 4.28 on day 1 and 4.13 on day 5, while titratable acidity increased to 0.72% and 0.98% lactic acid, respectively. On day 1, K2-11 and WiKim0121 (KFCC11890P) showed significantly lower pH and higher acidity than 81141B and non-inoculated control. K2-11 reached 8.93 log CFU/g on day 1 and peaked at 9.40 log CFU/g on day 3, significantly exceeding the other treatments. Although pH and acidity converged among treatments by day 5, K2-11 exhibited rapid early acidification and greater initial growth. These findings support *L. lactis* K2-11 as a promising starter culture candidate for improving the control and reproducibility of early-stage *kimchi* fermentation.

P4-34

IoT-based monitoring and indoor temperature control enhance fermentation stability and quality of traditional Korean soy sauce (*ganjang*)

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This study aimed to mitigate delayed maturation and quality inconsistency associated with outdoor fermentation of traditional Korean soy sauce. Soy sauce was fermented under outdoor variable-temperature and indoor temperature-controlled conditions, and manual quality indices were compared with real-time sensor signals collected via an IoT-based system. Indoor control markedly accelerated maturation, as total nitrogen exceeded 0.8% within 10 days and 2.0% within 100 days, whereas outdoor-fermented samples remained below 1.0% even after 200 days. Moreover, sensor-derived pH and electrical conductivity showed significant linear relationships with manually measured total nitrogen, total acidity, soluble solids, and lightness, indicating their applicability as real-time, non-destructive proxy indicators for monitoring fermentation progress and compositional changes. Overall, integrating indoor environmental control with IoT-based monitoring provides an effective strategy for reducing production time, enhancing process stability, and supporting standardized quality management in traditional Korean soy sauce production.

P4-35

Screening and enzymatic characterization of *Bacillus* spp. isolated from Korean traditional fermented foods and plant-derived resources

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Korean traditional fermented foods are rich reservoirs of *Bacillus* species that secrete industrially and nutritionally valuable enzymes. This study aimed to screen and characterize the enzymatic properties of *Bacillus* spp. isolated from such sources to identify candidate strains for industrial enzyme production and functional food development. A total of 480 *Bacillus* strains were isolated from Korean traditional fermented foods (*cheonggukjang*, *doenjang*, *gochujang*, *ganjang*, *kimchi*, *jangajji*, and *nuruk*) and diverse plant and fruit-vegetable resources. Strains were identified by 16S rRNA gene sequencing, and eight industrial enzymes (protease, laccase, α-amylase, cellulase, β-glucosidase, nattokinase, lipase, and xylanase) were screened using plate assays; α-glucosidase activity was additionally quantified spectrophotometrically. Of 135 strains identified, 115 belonged to the genus *Bacillus*, with *B. velezensis* (n=40), *B. subtilis* (n=30), and *B. amyloliquefaciens* (n=12) as the predominant species. β-Glucosidase activity was the most prevalent trait (85.4%, n=410), followed by protease (16.2%), nattokinase (14.2%), and cellulase (11.9%). Thirty-seven strains (7.7%) were multifunctional, co-producing four or more enzymes; the four strains co-producing five enzymes simultaneously were all *B. velezensis* and B. amyloliquefaciens derived from *doenjang* and kiwi. α-Glucosidase activity averaged 0.353 ± 0.402 OD (range, 0.043-3.630), with 22 strains (4.6%) exhibiting high activity (≥1.0 OD). These findings demonstrate that Korean traditional fermented foods and plant resources serve as valuable sources of multifunctional, enzyme-producing *Bacillus* strains with strong potential for industrial and functional food applications.

P4-36

Effects of traditional doenjang on gut microbiota and short-chain fatty acid production in high-fat diet-induced mice

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This study evaluated the effects of traditional doenjang on gut microbiota and short-chain fatty acid (SCFA) production in high-fat diet-induced mice. Gut microbial communities were analyzed by 16S rRNA sequencing, and fecal SCFAs were quantified after doenjang administration. Firmicutes and Bacteroidota were the dominant phyla in all groups. Principal coordinate analysis and PERMANOVA revealed significant alterations in microbial community structure following doenjang consumption ($p=0.001$). Doenjang-treated groups showed increased abundances of beneficial bacteria, including *Fusicatenibacter*, *Blautia*, *Lactobacillus*, and *Bifidobacterium*. Total SCFA concentrations were higher in TCD25-32 (194.3 μmol/g), TCD25-70 (182.3 μmol/g), and TFD25-1 (184.9 μmol/g) than in the normal diet group (144.8 μmol/g). Notably, butyrate production was highest in the TFD25-1 group (92.6 μmol/g). These results suggest that doenjang consumption beneficially modulates gut microbiota composition and enhances SCFA production, indicating its potential as a functional fermented food for promoting gut health.

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P4-37

Isolation and evaluation of probiotic lactic acid bacteria from Korean traditional fermented foods

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Lactic acid bacteria (LAB) isolated from Korean traditional fermented foods are considered promising probiotics due to their beneficial effects on human health. This study aimed to isolate LAB from Korean traditional fermented foods and evaluate their probiotic potential. A total of 25 LAB strains were isolated from *kimchi*, *doenjang*, *makgeolli*, and *jeotgal* collected in Jeollabuk-do, Korea. The isolates were identified by 16S rRNA gene sequencing and evaluated for acid tolerance, bile tolerance, heat tolerance, salt tolerance, and adhesion to HT-29 intestinal epithelial cells. The isolates exhibited strain-dependent probiotic characteristics. Most strains showed high tolerance to acid and bile conditions and demonstrated strong adhesion to HT-29 cells, suggesting good survival and colonization potential in the gastrointestinal tract. Heat and salt tolerance varied among strains, and several isolates belonging to *Lactiplantibacillus*, *Lacticaseibacillus*, and *Pediococcus* exhibited favorable probiotic properties across multiple evaluations. These findings indicate that Korean traditional fermented foods are valuable sources of probiotic LAB. The selected strains may serve as promising candidates for probiotic cultures and starter cultures in the development of functional fermented foods.

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P4-38

Changes in microbial communities and their physicochemical properties during the fermentation of doenjang

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Despite extensive research on doenjang fermentation, studies exploring the correlation between microbial dynamics and its quality attributes remain limited. This study was conducted to elucidate the relationship between microbial changes and physicochemical characteristics during the fermentation process of doenjang. During the fermentation period of doenjang, from day 0 to day 90, significant decreases were observed in moisture, pH, salinity, and monosaccharide levels such as glucose and fructose, while the contents of amino-type nitrogen (AN) and lactic acid increased. Analysis of microbial changes during the fermentation period of doenjang revealed that the proportions of *Bacillus* and *Tetragenococcus* increased as fermentation progressed, whereas the proportions of lactic acid bacteria, such as *Enterococcus*, *Pediococcus*, and *Leuconostoc*, decreased. *Bacillus* and *Tetragenococcus* exhibited similar correlation patterns with other variables. The microbial proportions of *Bacillus* and *Tetragenococcus* were positively correlated with AN and lactic acid content but negatively correlated with moisture, pH, salinity, and glucose content in *doenjang*. In contrast, the proportions of lactic acid bacteria such as *Enterococcus*, *Pediococcus* and *Leuconostoc* were negatively correlated with AN and lactic acid content, while showing positive correlations with moisture content, pH, salinity, and glucose content. These findings indicate a close correlation between microbial communities and quality characteristics during the fermentation of *doenjang*.

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P4-39

Immunomodulatory effects of traditional Korean *gochujang* in rats immunosuppressed with cyclophosphamide

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Fermented foods are consumed in several cultures worldwide and their health benefits. Fermented soybean products in Asia include soybean paste (*doenjang*), fermented soybeans (*cheonggukjang*), red pepper paste (*gochujang*, GCJ), and natto. These fermented foods are reportedly associated with health benefits, including the alleviation of colitis and improvement of immune function. In this study, we investigated the immune-enhancing effects of GCJs produced in four different regions of Korea (including a commercial brand) in cyclophosphamide-treated immunosuppressed rats. The GCJs-treated group showed prevention of weight loss, increased levels of butyric acid in the cecum, and increased weight of lymphoid organs such as the thymus and spleen. Whole blood and serum analysis revealed increased numbers of white blood cells, including granulocytes and lymphocytes, pro-inflammatory cytokines (IL-2, IL-12, IFN-γ, and TNF-α), and elevated immunoglobulin G levels. Additionally, splenocyte proliferation, splenic natural killer cell activity, and immune-related signal pathways (MAPK and NF-κB) were increased. Histological analysis revealed improved tissue structure in the GCJs group. In conclusion, these findings show that GCJs enhance immune function by promoting the growth of immune organs, increasing cytokine production, and activating immune-related signaling pathways.

This work was supported by "Traditional food safety monitoring program" under the Ministry of Agriculture, Food and Rural Affairs and partly Korea Agro-Fisheries and Food trade corporation in 2026.

P4-40

Complete genome sequence of *Lacticaseibacillus paracasei* DA-14M-4 isolated from ganjang and characterization of its antibacterial activity

Hee Gun Yang, Ji Won Seo, Bo Ram Jung, Myeong Seon Ryu, Hee Jong Yang, Do Youn Jeong*

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Lacticaseibacillus paracasei DA−14M−4, isolated from *ganjang*, samples collected in Sunchang, Republic of Korea, presented notable resistance to multiple antibiotics. Whole genome sequencing of the strain DA−14M−4 was performed by ChunLab, Inc. (Republic of Korea), using a combination of PacBio RSII and Illumina HiSeq platforms. The complete genome of strain DA−14M−4 consisted of a single circular chromosome of 3.1 Mb with a DNA G+C content of 46.5 mol% and a genome coverage of 966.54 x. Genome annotation predicted 3,077 genes, including 2,905 protein−coding genes, 77 RNA genes (15 rRNA genes, 59 tRNA genes, and 3 ncRNA genes), and 93 pseudogenes. Of the 2,905 protein−coding genes, 2,165 genes were assigned and strain DA−14M−4 had 72 genes (2.5%) associated with defense mechanisms, including bacitracin resistant genes bceA and bceB, a macrolide resistant gene macB. The genome sequence of *L. paracasei* DA−14M−4 provides valuable information for understanding the genetic basis of its antimicrobial resistance and ecological adaptation.

This research supported by "Project to make multi−ministerial national biological research resources more advanced project, funded by korea ministry of environment (MOE) (RS−2023−00230403).

P4-41

Potential probiotic properties of *Bacillus subtilis* CL197 isolated from *cheonggukjang*

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This study aimed to isolate a *Bacillus subtilis* strain from *cheonggukjang*, a traditional Korean fermented food, and evaluate its potential application as a probiotic food ingredient. To assess the applicability of the isolated strains, various physiological characteristics were evaluated, including extracellular enzyme activity, acid tolerance, bile tolerance, and intestinal adhesion ability. As a result, five candidate strains were selected, among which strain CL197 exhibited the most favorable physiological properties and was chosen for further analysis. Strain CL197 showed a survival rate of over 75% at pH 2.0 and more than 97% in the presence of 0.3% oxgall, demonstrating strong acid and bile tolerance. Notably, this strain exhibited an intestinal adhesion ability of over 72%, indicating its potential suitability for probiotic food applications. These findings suggest that *Bacillus subtilis* CL197 could be a promising probiotic candidate for functional food and related industrial applications.

This work was supported by "Traditional food safety monitoring program" under the Ministry of Agriculture, Food and Rural Affairs and partly Korea Agro-Fisheries and Food trade corporation in 2026.

P4-42

Valorization of *Sargassum horneri* through biotransformation by mold strains isolated from fermented foods

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Sargassum horneri, a brown macroalga, has recently accumulated in large quantities along the Korean coast, causing environmental concerns. However, it is also attracting attention as a valuable marine biomass resource. This study aimed to screen mold strains capable of biotransforming S. horneri polysaccharides and to evaluate the characteristics of the fermented products. The isolates were identified as *Aspergillus oryzae*, *Aspergillus niger*, and *Bjerkandera adusta*. The production of extracellular enzymes, including polysaccharide-degrading enzymes, was evaluated during submerged fermentation using a medium containing 2% *S. horneri*. Structural modification and depolymerization of *S. horneri* polysaccharides were investigated, and gel filtration chromatography confirmed the degradation of high-molecular-weight polysaccharides. The results demonstrated that the isolated mold strains possess the ability to utilize and biotransform the complex polysaccharides of *S. horneri* through the production of various hydrolytic enzymes. These findings suggest that the metabolites and biotransformed products generated during fermentation have potential applications as seaweed-derived functional food ingredients.

P4-43

Effect of initial sugar concentration on the quality characteristics of sugar-fed honey wine

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Sugar-fed honey is produced by feeding honey bees with sugar, followed by harvesting and ripening. However, because market demand is low relative to production volume, processing is necessary to encourage consumption. Accordingly, alcoholic fermented products derived from sugar-fed honey were prepared based on prior research. This study aimed to enhance their functionality, shelf life, and usability by subjecting them to acetic acid fermentation. We inoculated alcoholic fermentation products obtained from previous research (alcohol content 8.80 – 12.40%, total polyphenol content 12.26 – 14.34 mg/L, reducing sugar content 0.63 – 5.43 g/L) with a starter culture and evaluated their quality characteristics, antioxidant activity, and sensory properties throughout the fermentation process. The titratable acidity of the sugar-fed honey vinegar ranged from 5.09% to 6.09%, with acetic acid as the predominant organic acid, detected at concentrations between 40,762.00 and 53,369.80 mg/L. Both titratable acidity and organic acid content significantly decreased as the initial sugar content increased. The total polyphenol content ranged from 24.01 to 27.11 mg/100 mL, while ABTS and DPPH antioxidant activities ranged from 63.50% to 80.45% and 50.42% to 71.33%, respectively. Regarding total polyphenols and antioxidant activity, there was a trend toward improved nutritional and functional properties with increasing initial sugar content. Sensory evaluation results indicated that the treatment group with an initial sugar content of 20 ° Brix received the highest overall preference score of 7.20. The results of this study are expected to promote the diversification of sugar-fed honey-based products, generate new income sources for beekeeping farms, and contribute to revitalizing the stagnant beekeeping industry.

P4-44

Effect of initial sugar concentration on acetic acid fermentation and the quality of sugar-fed honey vinegar

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Sugar-fed honey is produced by feeding honey bees with sugar, followed by harvesting and ripening. However, because market demand is low relative to production volume, processing is necessary to encourage consumption. Accordingly, alcoholic fermented products derived from sugar-fed honey were prepared based on prior research. This study aimed to enhance their functionality, shelf life, and usability by subjecting them to acetic acid fermentation. We inoculated alcoholic fermentation products obtained from previous research (alcohol content 8.80 – 12.40%, total polyphenol content 12.26 – 14.34 mg/L, reducing sugar content 0.63 – 5.43 g/L) with a starter culture and evaluated their quality characteristics, antioxidant activity, and sensory properties throughout the fermentation process. The titratable acidity of the sugar-fed honey vinegar ranged from 5.09% to 6.09%, with acetic acid as the predominant organic acid, detected at concentrations between 40,762.00 and 53,369.80 mg/L. Both titratable acidity and organic acid content significantly decreased as the initial sugar content increased. The total polyphenol content ranged from 24.01 to 27.11 mg/100 mL, while ABTS and DPPH antioxidant activities ranged from 63.50% to 80.45% and 50.42% to 71.33%, respectively. Regarding total polyphenols and antioxidant activity, there was a trend toward improved nutritional and functional properties with increasing initial sugar content. Sensory evaluation results indicated that the treatment group with an initial sugar content of 20 ° Brix received the highest overall preference score of 7.20. The results of this study are expected to promote the diversification of sugar-fed honey-based products, generate new income sources for beekeeping farms, and contribute to revitalizing the stagnant beekeeping industry.

P4-45

Comparison of quality characteristics of plum wine by fruit maturity

Gowoon Kang[1], Yuyoung Kim[2*], Daewon Gwon[2], Rojin Lee[2], Suhwan Kim[3], Changki Huh[2]

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After harvesting, Prunus mume rapidly softens at room temperature and contains toxic cyanogenic glycosides and organic acids, which make it difficult to consume fresh. Therefore, processing methods involving sugar or alcohol are commonly employed. Alcohol-based processing typically involves the addition of commercially available distilled spirits. This study aimed to determine the optimal ripening conditions for plum wine production by analyzing quality characteristics, reducing sugar content, and sensory evaluations throughout the fermentation period of naturally fermented plum wine. Accordingly, plums were candied according to their ripeness—green plums, yellow plums, and a mixture of both—then diluted to 20 ° Brix, inoculated with Saccharomyces cerevisiae, and fermented at 25℃. The final alcohol content of the plum wine ranged from 7.7% to 9.7%, showing a significant decreasing trend as the plums' ripeness increased. Conversely, the soluble solids content, titratable acidity, and reducing sugar content ranged from 8.20 to 11.20 ° Brix, 0.79% to 1.02%, and 2.30 to 7.88 g/100 mL, respectively, all exhibiting a significant increase with ripeness. In sensory evaluations, the sample prepared using yellow plums received the highest preference across all categories. This study confirmed the potential for producing high-value-added products from yellow plums, whose use was previously limited due to tissue softening. This advancement is expected to increase the income of plum farmers and revitalize the local processing industry.

P4-46

Comparison of quality characteristics of plum vinegar by fruit maturity

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After harvesting, Prunus mume rapidly softens at room temperature and contains toxic cyanogenic glycosides and organic acids, which make it difficult to consume fresh. Accordingly, plum wine was produced using plums at various stages of ripeness, based on prior research. In this study, acetic acid fermentation was conducted to enhance the functionality, shelf life, and usability of the previously developed plum wine. The optimal plum ripeness for producing plum vinegar was determined by evaluating quality characteristics, antioxidant activity, and sensory attributes throughout the fermentation process. Plum wine used as a substrate for acetic acid fermentation exhibited quality characteristics, including alcohol content ranging from 7.7% to 9.7% and reducing sugar content between 22.93 and 78.68 g/L. The final titratable acidity of the plum vinegar produced ranged from 5.23% to 6.30%. The total polyphenol content varied between 69.26 and 83.95 mg GAE/100 mL, while the ABTS and DPPH radical scavenging activities were measured at 76.03 – 89.75% and 47.36 – 62.55%, respectively. Notably, antioxidant activity, along with nutritional and functional properties, significantly improved with increasing plum ripeness. In the final sensory evaluation, the sample fermented from a mixture of green and yellow plums received the highest overall preference score of 5.95. As a result of this study, it is anticipated that proposing a method to utilize a blend of yellow plums, known for their excellent functional properties, and green plums, valued for their favorable processing characteristics, will maximize the added value of raw plums and help revitalize the domestic fermented vinegar industry.

P4-47

Evaluation of critical control point monitoring and effectiveness in meat extract product processes

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This study evaluated the microbiological safety of processed meat extract products by assessing critical control point (CCP) effectiveness and microbial contamination during processing. Food samples, including raw materials, in-process products, and final products, and seven environmental samples were collected from a food facility in Jincheon, Korea. Total aerobic bacteria and coliform bacteria were 3.4 ± 0.0 and 1.7 ± 0.0 log CFU/g in raw materials, 5.0 ± 0.0 and 1.2 ± 0.0 log CFU/g in in-process products before heating, and 2.7 ± 0.0 and 1.9 ± 0.1 log CFU/g in in-process products after cooling, respectively. Non-sterilized final products contained total aerobic bacteria and coliform bacteria at 4.3 ± 0.1 and 3.2 ± 0.0 log CFU/g, whereas both were not detected in sterilized final products. In environmental samples, total aerobic bacteria were detected on the cutting room door handle, inside of bone cutter, and workers' hands at 6.0 ± 0.6, 1.8 ± 0.2, and 1.6 ± 0.1 log CFU/surface, respectively, while coliform bacteria were not detected. Foodborne pathogens were not detected in all samples. Considering bacterial contamination in final products, additional processing steps may be required to ensure product safety.

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P4-48

무증자 생쌀발효 기반 혼합 증류주 제조를 위한 당화제별 담금법의 적용성 평가

최준수[1*], 이재용[2], Elfiani Dwi[2], Di Wang[2], 이새벽[1,2], 최규택[2,3]
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본 연구는 지역특산 과실류 혼합 증류주 제조공정의 간소화를 위해 무증자 생쌀발효에 적용 가능한 당화제별 담금법을 예비 평가하고자 수행되었다. 실험구는 입국 생쌀구, 무증자용 개량누룩 생쌀구, 정제효소 생쌀구, 정제효소와 곡자 조합구, 고두밥 대조구로 구성하였으며, 모든 처리구에 전배양 효모 *Saccharomyces cerevisiae* NY21을 동일하게 접종하였다. 1단 담금은 25℃, 2단 담금은 20℃에서 진행하였고, pH, °Brix, 품온, CO_2 발생, 술덧 팽창, 향, 산취, 이취 및 점도 변화를 비교 평가하도록 설계하였다. 본 연구는 당화제의 단순 효소활성 비교가 아니라, 생쌀 담금법의 발효 안정성, 원주 생산성, 후속 과실 혼합발효 및 증류 적용 가능성을 판단하기 위한 기초 선별 연구이다. 최종 발효 결과는 당화제별 공정 적합성 판단과 소규모 양조장의 에너지 절감형 제조공정 표준화에 활용될 수 있을 것으로 기대된다.

P4-49

Optimization of carbon sources for submerged cultivation of *Auricularia heimuer* and pilot-scale fermentation

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The development of cost-effective culture media is essential for the industrial production of mushroom mycelia. This study evaluated food-based carbon sources for the submerged cultivation of *Auricularia heimuer* and examined their applicability to pilot-scale fermentation. Culture media were prepared using glucose or organic brown sugar at concentrations of 10, 20, and 30 g/L supplemented with 4 g/L yeast extract. After cultivation, mycelial biomass, pH, and soluble solid content were analyzed. Among the tested media, glucose supported significantly higher mycelial growth than organic brown sugar. The highest biomass was obtained with 30 g/L glucose (4.20 g/500 mL), followed by 20 g/L (3.36 g/500 mL) and 10 g/L glucose (2.52 g/500 mL). Based on these results, the optimal medium containing 30 g/L glucose was selected for scale-up fermentation in a 200 L pilot-scale fermenter. During pilot-scale cultivation, pH and soluble solid content were monitored as indicators of fermentation performance. A gradual decrease in pH and changes in soluble solids were observed throughout cultivation, reflecting active substrate utilization and mycelial metabolism. The optimized medium supported stable mycelial growth under pilot-scale conditions, demonstrating its suitability for large-scale production. These findings indicate that glucose is an effective carbon source for the submerged cultivation of *A. heimuer* and that the optimized medium can be successfully applied to pilot-scale fermentation. This study provides fundamental information for process scale-up and industrial production of *A. heimuer* mycelia.

This study was carried out with the support of 'Industry-Academia-Research Collabo R&D (RS-2025-02310402, Development of multifunctional materials that combine mushroom mycelium and fermentation technology)' provided by the Korea Technology and Information Promotion Agency for SMEs.

P4-50

Useful components of fermented bamboo leaf extract by mushroom mycelia and lactic acid bacteria

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Bamboo leaves contain various bioactive compounds with antioxidant and health-promoting properties and have potential as functional ingredients for companion animal foods. This study investigated the effects of complex fermentation using mushroom mycelia and lactic acid bacteria on the functional components of bamboo leaf extract. Bamboo leaf extract was first fermented with the mycelia of *Flammulina velutipes*, *Pleurotus ostreatus*, and *Phellinus linteus*. The mycelial-fermented extracts were subsequently subjected to secondary fermentation with *Lactobacillus brevis* or *Lactobacillus plantarum*. After fermentation, changes in bioactive compounds, total polyphenols, and free amino acids were analyzed. Among the fermentation groups, *L. brevis* produced bioactive compound levels of 6.65% and 7.29% in the *F. velutipes* and *P. ostreatus* samples, respectively, whereas the highest level (8.00%) was observed in the *P. linteus* and *L. plantarum* complex fermentation group. In addition, total polyphenol and free amino acid contents were generally higher in the fermented by *L. plantarum* samples than in the corresponding *L. brevis* groups. These results demonstrate that the synergistic action of mushroom mycelia and lactic acid bacteria effectively enhances the functional composition of bamboo leaf extract. The findings suggest that complex fermentation is a promising bioconversion strategy for improving the value of bamboo leaf-derived materials and may facilitate their application as functional ingredients in companion animal foods and other fermented products.

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P4-51

Optimization of fermentation conditions for mushroom mycelia cultivated on a sword bean and brown rice medium

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Canavalia gladiata (sword bean) is a functional crop containing various bioactive compounds, including isoflavones and canavanine, which exhibit antioxidant, anti-inflammatory, and immune-enhancing activities. However, its utilization remains largely limited to traditional tea products, highlighting the need for value-added processing technologies. This study aimed to optimize a sword bean–brown rice medium for mushroom mycelial fermentation and to evaluate changes in functional components after fermentation. Mixed substrates containing sword bean and brown rice at ratios of 30:70, 40:60, 50:50, and 60:40 (w/w) were prepared and inoculated with *Lentinula edodes*, *Pleurotus ostreatus*, and *Phellinus linteus*. Mycelial growth was monitored to determine the optimal substrate composition. Among the tested formulations, the medium containing 60% sword bean and 40% brown rice showed the most favorable mycelial growth for all three mushroom species. Chemical analysis of fermented products revealed significant increases in adenosine and other bioactive compounds compared with the unfermented substrate. These results indicate that mushroom mycelial fermentation can effectively enhance the functional component profile of sword bean-based materials. The optimized sword bean–brown rice medium may serve as a promising substrate for producing value-added fermented products and functional food ingredients.

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P4-52

Development of a competitive lateral flow immunoassay for rapid screening of ochratoxin A in corn-based processed foods

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Ochratoxin A (OTA) is a major mycotoxin that can contaminate stored cereals and cereal-based processed foods during storage and distribution, highlighting the need for rapid screening methods for contamination control. In this study, a competitive lateral flow immunoassay (LFA) was developed for the rapid screening of OTA contamination in corn-based processed foods, using 5 μg/kg (5 ppb) as the target screening concentration. An OTA-specific monoclonal antibody-gold nanoparticle conjugate was used, and 5 g of ground sample was extracted with 10 mL of 10% MeOH/PBS for 15 min before analysis. OTA-spiked samples were prepared at 0, 5, 10, and 20 μg/kg, and 200 μL of the extract was applied to the strip. As a result, the color intensity of the test line decreased as the OTA concentration increased. The visual detection level was confirmed as 2.5 ng/mL in the standard solution, corresponding to 5 μg/kg (5 ppb) in the sample matrix. The assay was completed within 15 min, suggesting that the developed LFA has potential as a rapid on-site screening tool for OTA contamination control in corn-based processed foods during storage and distribution.

P4-53

Development and evaluation of a competitive lateral flow assay based on a monoclonal antibody specific to edible insects from thermal stable-soluble proteins

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Edible insects have attracted considerable attention as sustainable alternative protein sources due to their high protein production efficiency and low environmental impact. However, edible insects, including *Tenebrio molitor* larva (TML), may contain allergenic proteins with potential cross-reactivity to crustacean allergens, highlighting the need for rapid and on-site analytical methods for detecting their presence in processed foods. In this study, a monoclonal antibody (MTML 5F5-1D6) targeting the thermal stable-soluble protein (TSSP) of TML was produced and purified, and a competitive lateral flow assay (LFA) was developed based on the antibody. The sensitivity and cross-reactivity of the developed LFA were evaluated, and its applicability was assessed using cookie samples containing TML. Cross-reactivity analysis demonstrated that the LFA reacted with five edible insect species, including TML, among twelve food ingredients tested, while showing minimal cross-reactivity with non-insect food materials. The developed assay successfully detected TML in cookie samples at concentrations as low as 0.5% (w/w). These results suggest that the proposed LFA provides a rapid and practical tool for the on-site detection of TML and edible insect-derived TSSP in processed foods, thereby supporting food allergen monitoring and labeling management.

P4-54

Development of an Ara h 3-specific competitive lateral flow immunoassay for the rapid detection of peanut allergen contamination in processed foods

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Peanut allergens may persist in processed foods and can be inadvertently introduced through cross-contamination during manufacturing and distribution, highlighting the need for rapid on-site screening. In this study, Ara h 3, one of the major peanut proteins and a potential marker for peanut contamination in processed foods, was selected as the target analyte, and a competitive lateral flow assay (LFA) was developed using an Ara h 3-specific monoclonal antibody. The preparation conditions for the gold nanoparticle (AuNP)-antibody conjugate were optimized, and the concentrations of the antigen and antibody immobilized on the test line and control line were optimized at 0.01 mg/mL and 0.5 mg/mL, respectively. The optimized LFA strip enabled visual detection within 15 minutes, with a limit of detection (LOD) of 5 μg/mL. Cross-reactivity evaluation showed no significant reactions with other allergenic food proteins, such as those from soybean and wheat, confirming the high specificity of the developed LFA. Furthermore, spike-and-recovery analysis using actual processed food samples demonstrated that the assay could successfully detect peanut allergens within complex food matrices. The competitive LFA developed in this study is expected to serve as an effective on-site analytical tool for rapidly monitoring unintentional peanut allergen contamination throughout food manufacturing and distribution stages.

P4-55

Effect of combined immersion treatments with ethanol, vitamin C, and organic acid on the reduction of *Listeria monocytogenes* in fresh-cut melon

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Fresh-cut melon is susceptible to microbial contamination during peeling and cutting. This study evaluated combined immersion treatments with ethanol, vitamin C, and organic acid for reducing *Listeria monocytogenes* in fresh-cut melon. Melon and environmental samples were collected from a facility in Gyeongnam, Korea. Aerobic plate counts ranged from 1.20 ± 0.28 to 4.49 ± 0.02 log CFU/g, while coliforms, *Escherichia coli*, *Bacillus cereus*, *L. monocytogenes*, and *Salmonella* spp. were not detected. Among eight single immersion treatments, 80% ethanol showed the highest reduction effect, but did not completely eliminate *L. monocytogenes*. Thus, two-step combined treatments were tested, and 11 combinations resulted in no detection of L. monocytogenes. Based on sensory evaluation, four treatments were selected for field application. These treatments reduced aerobic plate counts by 88.1 – 97.6%, and *E. coli*, *coliforms*, *B. cereus*, and *L. monocytogenes* were not detected. These results suggest that combined immersion treatment can improve fresh-cut melon safety. These results suggest that combined immersion treatment can improve the microbial safety of fresh-cut melon during processing and distribution.

P4-56

Cloning and soluble expression optimization of strain-derived cycloisomaltooligosaccharide glucanotransferases in *Escherichia coli*

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Cycloisomaltooligosaccharide glucanotransferase (CITase) is a promising biocatalyst for synthesizing functional oligosaccharides through the conversion of dextran into cycloisomaltooligosaccharides. In this study, CITase genes from *Bacillus circulans* T-3040, *Paenibacillus daejeonensis* KACC 11453, and Thermoanaerobacter thermocopriae were cloned into pCold1, pET32a, or pET41a and expressed in *Escherichia coli* strains BL21 (DE3), BL21-AI, and Rosetta-gami B (DE3). SDS-PAGE analysis revealed that the BL21-AI/pET32a combination exhibited the highest apparent soluble CITase expression. Induction conditions are being optimized across nine combinations of IPTG (0.025 – 0.1 mM) and L-arabinose (0.05 – 0.2%). Since TtCITase has a larger predicted molecular size than BcCITase and PdCITase, four truncation variants were constructed to improve its soluble expression by deleting the predicted N-terminal signal peptide-like region and/or truncating the C-terminal region at residues 839 or 1137. These variants are currently being evaluated by SDS-PAGE. Subsequent biochemical characterization will include determination of optimal temperature, pH, and kinetic parameters. This study provides a foundation for selecting appropriate expression systems and induction conditions for soluble CITase production.

P4-57

Biological and genomic characterization of a novel bacteriophage, C1, infecting *Pectobacterium carotovorum*

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Pectobacterium carotovorum is a plant-pathogenic bacterium that causes soft rot disease, reducing agricultural productivity. Antibiotics have been widely used to control plant pathogens, but their effectiveness is limited due to antimicrobial resistance. As a solution, phages have emerged as a promising alternative. In this study, we isolated a novel phage, designated C1, specifically infecting *P. carotovorum* subsp. *carotovorum* pcc 27. Transmission electron microscopy revealed an icosahedral capsid approximately 62 nm in diameter, with a short tail, exhibiting podovirus-like morphology. The genome was 37,885 bp in length, with a GC content of 47.65%, and contained 41 predicted coding sequences. Genome annotation identified genes involved in structural assembly, DNA packaging, replication, and host lysis. Phage C1 lysed its host within 2 h after infection. C1 remained stable under UV-A irradiation, at temperatures up to 45℃, pH 4 to 11, and 1 M NaCl. One-step growth curve analysis revealed that C1 has a short latent period of 10 min, and a burst size of approximately 70 PFU per infected cell. Together, our findings demonstrate the potential of phage C1 as an effective biocontrol agent against P. carotovorum.

P4-58

A phage-derived genetic element enhances antibiotic susceptibility through selective outer membrane perturbation

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Antimicrobial resistance threatens the effective control of bacterial infections. Phage-derived genetic elements can provide new opportunities for antimicrobial development. We investigated whether genetic elements from *Escherichia coli* phage EP26 could alter antibiotic susceptibility. Screening of an EP26 genomic library identified N1C3, a clone exhibiting a >2-fold reduction in colistin MIC compared with the control. Sequence analysis revealed that N1C3 contains two hypothetical protein-coding genes (HP1 and HP2) and a ribonucleotide reductase gene, with HP2 as a major contributor to the phenotype. In addition to colistin, N1C3 enhanced susceptibility to multiple antibiotics, including polymyxin B. N1C3 significantly increased outer membrane permeability, whereas inner membrane permeability and membrane potential remained unchanged. Transcriptomic analysis revealed alterations in cell envelope-associated pathways, including repression of surface polysaccharide export genes. These findings indicate that N1C3 selectively perturbs the outer membrane barrier, enhancing susceptibility to multiple antibiotics. Overall, this study suggests the potential of phage-derived genetic elements as antimicrobial sensitizers that improve the efficacy of existing antibiotics.

P4-59

Fermentation and quality characterization for developing a low-alcohol smoothie-type fermented beverage based on raw Andong yam

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Andong yam (*Dioscorea polystachya*) is a regional specialty crop rich in mucilage polysaccharides, with potential as an ingredient for fermented beverages and smoothie-type foods. However, most previous studies have focused on the composition and bioactivity of raw materials or extracts, while fermentation applicability and physical properties relevant to actual beverage production remain limited. This study was conducted as a preliminary investigation for developing a low-alcohol smoothie-type fermented beverage using raw Andong yam as a substrate, aiming to evaluate fermentation suitability and basic quality characteristics according to raw material formulation conditions. In the preliminary fermentation, the addition method and formulation level of Andong yam were varied, and pH, soluble solids, ethanol production, viscosity, and phase separation were measured during fermentation. In addition, basic sensory characteristics including sourness, bitterness, particle perception, and overall texture were assessed to examine product applicability. This study examined, at an early stage, the effects of Andong yam on the fermentation stability, physical properties, and product quality of low-alcohol fermented beverages, and is expected to provide foundational data for the future optimization of fermentation conditions and smoothie-type matrices.

P4-60

Enzymatic production of α-1,6-linked oligosaccharides and their digestibility

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Maltooligosaccharides (MOs) are widely used in the food industry but are rapidly hydrolyzed due to their α−1,4 linkages. To overcome this limitation, enzymatic conversion to α−1,6−linked isomaltooligosaccharides (IMOs) using transglucosidase (TG) has been proposed. However, commercial IMOs are still rapidly hydrolyzed because they predominantly contain low−DP oligosaccharides (DP≤4). Therefore, recent studies have focused on producing high−DP IMOs using 4,6−α−glucosyltransferase (4,6−GT). In this study, we investigated the production of high−DP IMOs by comparing the capabilities of TG, 4,6−GT, and TtTG. TG mainly produced panose, whereas 4,6−αGT preferentially utilized high−DP substrates. In contrast, TtTG generated panose−type oligosaccharides regardless of substrate and catalyzed transglycosylation using α−1,6 substrates. When applied to MOs, TtTG−treated samples showed lower digestibility than commercial IMOs even after 1 h. These results demonstrate that TtTG produce high−DP α−1,6 linked oligosaccharides within a short time. Overall, TtTG shows industrial potential for converting low−cost MOs into high−value oligosaccharides.

P4-61

Evaluation of a *Salmonella* real-time PCR method

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Salmonella outbreaks continue to occur in Korea, and symptoms usually appear within 48 hours. A rapid detection is needed in the early stages of *Salmonella* infection. The conventional culture method requires several sequential steps of pre-enrichment, selective enrichment, and biochemical or serological identification, so it takes more than 5 days and requires skilled personnel. To overcome these limitations, various rapid detection methods such as PCR, LAMP, and ELISA have been developed. Among them, PCR amplifies a specific target gene in a short time using primers complementary to the target DNA sequence. In this study, the aim was to evaluate the performance of *Salmonella* real-time PCR kit and DNA extraction kit, and to determine whether they can be applied to rapid monitoring of Salmonella in real food samples. For this purpose, *Salmonella Enteritidis* and six non-*Salmonella* foodborne bacteria were used. In the specificity test, all six major non-*Salmonella* foodborne pathogens were negative in real-time PCR method, confirming specificity in this study. In the sensitivity test, the real-time PCR method detected *Salmonella* at 3 log CFU/mL. In monitoring test, some foods that were negative by the culture method in Korean Food Code were positive by the real-time PCR method, which was interpreted as detection of DNA derived from dead *Salmonella* cells.

P4-62

Selection and evaluation of ammonia-assimilating strains for ammonium removal in aquatic systems

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Ammonia nitrogen in aquatic systems is a major factor causing growth inhibition and mortality in aquatic organisms. In particular, ammonia is highly toxic and exists in equilibrium with ammonium ions, with its proportion increasing as pH rises. This study evaluated the ammonium metabolism ability of probiotic strains and their potential for improving water quality. The strains were cultured in a medium containing ammonium as the sole nitrogen source under various conditions, including temperature, pH, cultivation period, medium composition, and initial ammonium concentration. After cultivation, cell growth, medium pH, and ammonium ion concentration were measured. Strains showing superior ammonium reduction ability were identified by 16S rRNA gene sequencing. The probiotic strains significantly reduced ammonium ion concentrations under various initial ammonium concentrations, and ammonium reduction was observed even at low concentrations. Cell growth showed a positive correlation with ammonium reduction, and medium pH decreased during cultivation. These results suggest that the isolated probiotic strains effectively metabolize NH^{4+} and have potential applications in water quality improvement.

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P4-63

Isolation and screening of halotolerant microorganisms from Korean salted seafood for histamine reduction

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Histamine accumulation in salted and fermented seafood is a major food safety concern. Histamine is a representative biogenic amine produced during fermentation or storage through microbial conversion of histidine. When accumulated at high levels, histamine can cause adverse reactions in consumers and create challenges for quality control and regulatory compliance in international markets. In particular, *Jeotgal* and fish sauce are susceptible to histamine accumulation because prolonged fermentation promotes protein degradation, providing histidine-rich substrates for halotolerant microorganisms. Therefore, microbial strategies are needed to prevent or reduce excessive histamine accumulation in fermented seafood. This study aims to isolate histamine-reducing microorganisms from Korean salted seafood and evaluate their potential as starter cultures for fermented seafood. Salt-tolerant isolates are first selected from the samples. Strains with histamine-producing potential are then excluded, and the isolates are further screened for histamine-reducing activity. The selected strains are identified and evaluated for safety and functional properties. This study is expected to provide preliminary microbial resources for improving the safety of fermented seafood products.

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P4-64

Evaluation of enhanced lignan recovery and utilization from *Schisandra chinensis* pomace through enzymatic pretreatment and reconstituted SCOBY fermentation

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Schisandra chinensis pomace, a by-product generated during syrup and beverage production, contains substantial amounts of seed-derived lignans but remains underutilized. Fermentation promotes the release and transformation of bioactive compounds, and previous studies have suggested that lactic acid bacteria (LAB) may contribute to increased lignan contents during Schisandra fermentation. This study aims to improve lignan recovery and utilization from *S. chinensis* pomace through enzymatic pretreatment and reconstituted SCOBY-based kombucha fermentation. Enzymatic pretreatment was performed using cellulase, pectinase, and hemicellulase, and optimal conditions were evaluated based on lignan content, total phenolic content, total flavonoid content, and antioxidant activity. Yeasts, acetic acid bacteria, and LAB will be isolated from commercial kombucha SCOBY to construct conventional and LAB-containing reconstituted SCOBY systems. Kombucha fermentation using S. chinensis pomace will be performed to evaluate fermentation characteristics, lignan profiles, antioxidant activity, and anti-inflammatory and hepatoprotective activities. This study is expected to enhance lignan utilization from *S. chinensis* pomace and support the development of value-added functional kombucha through by-product upcycling.

P4-65

Potential of probiotic lactic acid bacteria as oral health-promoting agents

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Oral diseases, including dental caries and periodontal inflammation, are closely associated with imbalances in the oral microbiota. Probiotic lactic acid bacteria (LAB) have gained attention as functional ingredients capable of modulating the oral microbial environment and supporting oral health. In this study, selected LAB strains were evaluated for their oral health-promoting potential. Candidate strains were screened for antimicrobial activity against major oral pathogens, including *Streptococcus mutans* and *Porphyromonas gingivalis*. The selected strains were further assessed for adhesion to oral epithelial cells, inhibition of biofilm formation, anti-inflammatory activity, and safety characteristics. The LAB strains exhibited strong antimicrobial activity and effectively suppressed the growth of oral pathogens. They also showed high adhesion ability to oral epithelial cells and significantly inhibited *S. mutans* biofilm formation. In addition, treatment with LAB reduced the production of pro-inflammatory cytokines, including IL-6 and TNF-α, indicating potential anti-inflammatory effects. Safety evaluation demonstrated that all tested strains were non-hemolytic and showed acceptable antibiotic susceptibility profiles. These results suggest that the selected LAB strains possess beneficial properties for oral health management through inhibition of pathogenic bacteria, prevention of biofilm formation, and modulation of inflammatory responses. Therefore, they may serve as promising functional ingredients for the development of probiotic-based oral care products and functional foods aimed at improving oral health.

P4-66

Oral health-promoting potential of lactic acid bacteria fermented whey

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Whey is a nutrient-rich dairy by-product that can be valorized through fermentation with probiotic lactic acid bacteria (LAB). This study evaluated the oral health-promoting potential of whey fermented with selected LAB strains. Candidate strains were previously screened for their suitability in whey fermentation and subsequently used to produce fermented whey under controlled conditions. The fermented whey was assessed for antimicrobial and anti-biofilm activities against major oral pathogens, including *Streptococcus mutans* and *Porphyromonas gingivalis*. In addition, adhesion of LAB to oral epithelial cells and anti-inflammatory effects were evaluated using in vitro models. Fermented whey significantly inhibited the growth of *S. mutans* and reduced its biofilm formation. Partial inhibitory activity against *P. gingivalis* was also observed. LAB cells and metabolites present in the fermented whey exhibited strong adhesion to oral epithelial cells, suggesting their potential to colonize and interact with the oral environment. Furthermore, treatment with fermented whey reduced the production of pro-inflammatory cytokines, including IL-6 and TNF-α, indicating anti-inflammatory activity. These results demonstrate that whey fermented with selected probiotic LAB possesses antimicrobial, anti-biofilm, and anti-inflammatory properties that may contribute to oral health improvement. Therefore, fermented whey has potential as a functional ingredient for the development of probiotic-based oral care products and functional foods aimed at modulating oral microbiota and promoting oral health.

P4-67

Effects of lactic acid bacteria fermentation on the osteogenic activity of *Semisulcospira libertina* extract

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Semisulcospira libertina (dasulgi), a freshwater snail traditionally consumed in Korea, has long been recognized as a valuable nutritional resource and a traditional food associated with bone health. This study investigated the bone health-promoting potential of a hot-water extract of *S. libertina* (SLE) and its lactic acid bacteria-fermented product (F-SLE). SLE was prepared by hot-water extraction, while F-SLE was obtained through fermentation with selected lactic acid bacteria. Fermentation promoted protein hydrolysis and increased free amino acid contents, suggesting enhanced bioavailability of bioactive components. The effects of SLE and F-SLE on osteoblast differentiation were evaluated using MC3T3-E1 pre-osteoblast cells. Both samples showed no cytotoxicity at concentrations ranging from 25 to 200 μg/mL. Compared with SLE and the untreated control, F-SLE significantly enhanced alkaline phosphatase (ALP) activity and mineralized nodule formation. Furthermore, F-SLE markedly upregulated the mRNA expression of osteogenic marker genes, including Runx2, BMP-2, and osteocalcin, indicating enhanced osteoblast differentiation and bone-forming activity. These results demonstrate that lactic acid bacteria fermentation enhances the osteogenic potential of *S. libertina* extract, possibly through the generation of bioactive peptides and other low-molecular-weight compounds during fermentation. Collectively, the findings suggest that F-SLE has considerable potential as a functional food ingredient for promoting bone health and preventing age-related bone loss.

P4-68

땅콩과 새싹땅콩의 Ara h 1 발현 및 알레르기 유발 가능성 비교

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땅콩나물은 기능성 식품 및 화장품 소재로서 주목받고 있으나, 땅콩과 비교한 면역학적 안전성은 아직 명확히 규명되지 않았다. 본 연구에서는 발아 과정에서 땅콩 단백질 추출물(peanut protein extract, PPE)과 땅콩나물 단백질 추출물(peanut sprout protein extracts, PSPEs)의 Ara h 1 발현, 항산화 활성 및 면역 활성화 가능성의 변화를 평가하였다. 땅콩나물은 발아 0일부터 7일까지 수집하였으며, PSPEs의 DPPH 라디칼 소거능, 비특이적 비만세포 활성화 및 대식세포 염증성 활성화 가능성을 RBL-2H3 비만세포와 RAW264.7 대식세포를 이용하여 평가하였다. PSPEs는 본 연구의 단백질 추출 조건에서 제한적인 DPPH 라디칼 소거능만을 나타냈다. 발아가 진행됨에 따라 약 70 및 21 kDa 부근의 주요 단백질 밴드가 감소하였으며, PPE와 비교하여 PSPEs에서 Ara h 1 발현이 현저히 감소하였다. RBL-2H3 세포에서 PSPEs는 형태학적 활성화, β-hexosaminidase 방출 및 TNF-α 방출을 뚜렷하게 유도하지 않았으며, 이는 본 실험 조건에서 PSPEs의 비특이적 비만세포 활성화 가능성이 낮음을 시사한다. RAW264.7 세포에서 PPE는 nitric oxide 생성과 TNF-α 방출을 증가시킨 반면, PSPEs는 특히 발아 3일 이후 낮은 대식세포 염증성 활성화 반응을 나타냈다. 이러한 결과는 땅콩 발아가 Ara h 1 함량을 감소시키고 추출물에 의해 유도되는 면역 활성화 가능성을 완화할 수 있음을 시사하며, 땅콩나물이 비교적 안전한 기능성 식품 및 화장품 소재로 활용될 가능성을 뒷받침한다. 다만 PSPEs의 알레르기 유발 가능성 감소 여부를 확인하기 위해서는 알레르겐 특이적 IgE 매개 반응을 평가하는 추가 연구가 필요하다.

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P4-69

Current evidence and a conceptual framework for data-driven quality management and traceability in plant-based and cultivated meat

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Plant-based and cultivated meat are emerging alternatives whose quality and safety are shaped by multistage, time-dependent interactions among raw materials or biological starting conditions, processing environments, and product states. Accordingly, point-in-time inspection alone may be insufficient to explain process variation, detect deviations, or support timely intervention. This review synthesizes current evidence on data-driven quality management and traceability in plant-based and cultivated meat production, focusing on two enabling pillars: Internet of Things (IoT)- and sensor-based evidence generation, and Artificial Intelligence (AI)-enabled analytics for monitoring, prediction, and decision support. The review organizes key manufacturing stages and monitoring targets across plant-based processing, including ingredient handling, formulation, structuring, thermal setting, packaging, and cold-chain exposure, as well as cultivated meat processes, including cell line selection, media preparation, seed train expansion, bioreactor culture, harvest, and downstream handling. A compact signal-standardization framework is proposed to link observable signals with Critical Process Parameters (CPPs), Critical Quality Attributes (CQAs), and hazard-relevant risk states. Representative sensing configurations and AI applications further indicate that synchronized timestamps, batch or lot identifiers, standardized metadata, and event-linked records are essential for transforming heterogeneous measurements into traceability-ready evidence. Although current applications remain limited by pilot-scale datasets, weak external validation, and insufficient data governance, the integration of IoT and AI may support more interpretable, auditable, and timely quality management in next-generation meat-alternative production systems.

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P4-70

Extended HACCP and preventive control systems for novel foods: A review of global regulatory frameworks and digital applications

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This mini-review conceptualizes an extended HACCP-based preventive control framework for novel foods, including plant-based meat and cultured meat, to address safety requirements beyond conventional process-centered controls. Comparative analysis revealed marked heterogeneity in regulatory approaches across jurisdictions, which may complicate industrial compliance. In addition, non-process hazards, including allergen cross-contact in complex supply chains, and atypical risks associated with bioreactor-based production, such as potential unforeseen toxicity, are difficult to manage using conventional manual monitoring alone. Based on global industrial practices related to Smart HACCP, this review examines the applicability of AI-driven predictive modeling, including digital twins and multi-omics approaches, IoT-based sensors, and blockchain-enabled traceability for enhancing data integrity and real-time verification. These digital functions may support stringent pre-market approval requirements for novel foods. Overall, integration of traditional critical control point management, non-process hazard controls, and robust digital infrastructure provides a practical foundation for strengthening safety assurance and harmonizing compliance strategies in novel food production.

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P4-71

Isolation and characterization of *Pseudomonas silesiensis* ANU-5 with efficient indole degradation

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Livestock manure generates various odor-causing compounds, including indole and skatole, which are major contributors to offensive livestock odors. In this study, indole-degrading microorganisms were isolated from swine manure, and the physiological and biochemical characteristics of the selected strain were investigated. A total of 48 isolates were screened using MSM medium containing indole or skatole as the sole carbon source and evaluated by DMAB assay. Among them, isolate ANU-5 showed reproducible indole degradation activity and was identified as *Pseudomonas silesiensis* ANU-5 by 16S rRNA sequencing. The strain showed favorable growth under aerobic conditions at pH 7 and 15-20℃ and tolerated indole concentrations up to 250 ppm. API-ZYM analysis revealed several enzymatic activities related to aromatic compound metabolism, and PCR analysis confirmed the presence of putative indole degradation-related genes, including iacA, styA, and pcaG. HPLC analysis demonstrated a marked reduction of the indole peak in ANU-5-inoculated samples, while GC-MS analysis detected various metabolites generated during indole transformation. Based on metabolite profiles, a possible indole biotransformation pathway was proposed. These results suggest that *Pseudomonas silesiensis* ANU-5 has potential as a microbial resource for reducing livestock manure odor through biological indole degradation.

P4-72

Cyclical cold plasma module as a dynamic intervention for microbial control and quality preservation of red grapes and cherry tomatoes during storage

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Ultraviolet B (UVB) irradiation and advanced glycation end-products (AGEs) accelerate skin inflammaging, the premature aging triggered by chronic inflammation. This study investigated the anti-inflammatory effects of fermented licorice extract (FLE) produced using *Leuconostoc mesenteroides* and analyzed fermentation-induced metabolic changes through untargeted metabolomics. The cellular anti-inflammatory activities of unfermented licorice extract (ULE) and FLE were evaluated in HaCaT keratinocytes exposed to glyoxal-derived AGEs (GO-AGEs) and UVB irradiation. At 10 μg/mL, FLE reduced interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) production by 46% and 52%, respectively, and suppressed prostaglandin E2 (PGE_2) secretion, receptor of AGEs (RAGE) expression, nuclear factor-kappa B (NF-κB) translocation, and mitogen-activated protein kinase (MAPK) phosphorylation. Untargeted metabolomics revealed 42 metabolites that changed during fermentation. Glycosylated compounds, including glycyrrhizin, decreased significantly after fermentation, whereas their deglycosylated aglucones such as 18β-glycyrrhetic acid and isoliquiritigenin increased markedly. Correlation analysis showed strong positive associations between these metabolites and anti-inflammatory activity, suggesting deglycosylation as a key mechanism underlying the enhanced bioactivity of FLE. In conclusion, these findings demonstrate that fermentation improves the functional properties of licorice and highlights the potential use of FLE as a promising bioactive ingredient for managing glycation- and UV-induced skin inflammation.

P4-73

Microbial inactivation and quality retention of blueberries using continuous in-package dielectric barrier discharge cold plasma

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Cold atmospheric plasma (CAP) is an efficient non-thermal technology for decontaminating packaged foods with minimal quality impact. This study evaluated a novel continuous in-package dielectric barrier discharge cold plasma (DBD-CP) system using blueberries as a model. The system exhibited a typical filamentary discharge, reaching average power levels of 52.1 W and 86.5 W at 80 kV and 90 kV, respectively. Optical emission spectroscopy (OES) confirmed that the system successfully generated reactive oxygen and nitrogen species (RONS), with atomic oxygen intensity strongly correlated to voltage. Inactivation trials showed that both voltage and treatment time significantly affected efficacy, with treatment time being the dominant factor. Maximum log reductions of 3.10 CFU/g for *E. coli* O157:H7 and 3.02 CFU/g for *L. monocytogenes* were achieved at 90 kV for 48 sec. Furthermore, the treatment significantly suppressed background microflora during 7-day refrigerated storage. Regarding quality, attributes such as pH, firmness, total soluble solids (TSS), total phenolic content and color remained stable, while total anthocyanin content was significantly enhanced. Pearson correlation revealed that voltage primarily drove RONS generation, whereas total energy predicted microbial inactivation. These findings demonstrate that the continuous DBD-CP system is an effective approach for improving the microbial safety of packaged blueberries while preserving key nutritional attributes.

P4-74

Optimization of propagation strategy and characterization of a *Listeria monocytogenes*-specific phage

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Efficient propagation of *Listeria monocytogenes* (LM)-specific phages remains challenging due to the its relatively longer generation time and lower energy efficiency. This study aimed to optimize phage propagation strategy and characterize biological and genomic properties. Phage production efficiency was compared between two-stage culture (TSC) and the plate wash method (PWM) based on the resulting phage titers. The carbon source concentration in the medium was optimized by supplementing glucose or glycerol at 1-9 g/L. Phage morphology, genomic characteristics, host range and stability under different temperature and pH conditions were evaluated. TSC produced a significantly higher titer than PWM, reaching 9.62±0.03 log PFU/mL ($p<0.05$). Glucose supplementation at 3 g/L reduced LM generation time from 3.27 h to 1.82 h ($p<0.05$), supporting enhanced phage propagation. The phage was identified as a Siphovirus-like phage with a 37,618 bp genome containing 73 open reading frames and was classified within the genus Psavirus. The phage showed narrow specificity and remained stable at pH 4-11 and -80 to 50℃. This study provides an effective propagation strategy for LM-specific phages and demonstrates the potential of the phage as a biocontrol agent for improving food safety.

PART 5 Nutritional, Bioactive and Functional Property

P5-01

Antioxidant and tyrosinase inhibitory activities of hot-water extracts from a mixture of *Torreya nucifera* leaves, *Rosa rugosa* flowers, and *Rosa rugosa* leaves

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Torreya nucifera and *Rosa rugosa* are subtropical resources with potential as functional cosmetic ingredients. This study aimed to determine their optimal blending ratio. Mixed hot-water extracts were prepared from *T. nucifera* leaves (TL), *R. rugosa* flowers (RF), and *R. rugosa* leaves (RL) at four different weight ratios (1:1:1, 2:1:1, 1:2:1, and 1:1:2, w/w/w), and their antioxidant and tyrosinase inhibitory activities were evaluated along with quantitative HPLC analysis of major bioactive compounds. Among the tested groups, the 1:1:2 ratio (TL:RF:RL) exhibited the most potent biological activities. This mixture showed the highest antioxidant capacity, with SC50 values of 32.10 μg/mL for DPPH and 9.34 μg/mL for ABTS radicals, and demonstrated notable tyrosinase inhibitory activity. HPLC analysis revealed that the 1:1:2 mixture contained high concentrations of marker compounds, specifically hyperoside (2,570 μg/g), chlorogenic acid (91.1 μg/g), and quercetin (46.4 μg/g). In conclusion, the 1:1:2 mixed extract (TL:RF:RL) shows great promise as a multi-functional cosmetic ingredient, offering potent antioxidant and tyrosinase inhibitory activities for industrial applications.

P5-02

Optimization of blending ratios for *Camellia japonica* and *Rosa rugosa* hot-water extracts as functional nutricosmetic materials: Balancing efficacy and industrial feasibility

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This study was conducted to develop cost-effective, high-efficacy nutricosmetic ingredients by evaluating the combined effects of *Camellia japonica* leaves (CL) and *Rosa rugosa* flowers (RF). Mixed hot-water extracts (90℃ for 3 h) were prepared at various weight ratios (CL:RF = 1:1, 2:1, and 1:2, w/w) to determine the optimal formulation. The 1:1 ratio achieved an extraction yield of 28.73% and exhibited potent antioxidant activity, with SC50 values of 212.01 μg/mL and 76.52 μg/mL for DPPH and ABTS radicals, respectively. The IC50 value for tyrosinase inhibition was 870.43 μg/mL, representing a marked improvement compared with the *C. japonica* extract alone (1,273.74 μg/mL). HPLC analysis identified high concentrations of key bioactive compounds in the 1:1 mixture, specifically gallic acid (3,025 μg/g) and ellagic acid (4,896 μg/g). Based on these results, the 1:1 ratio was selected as the optimal formulation. Although the 1:2 ratio exhibited slightly higher bioactivity, the 1:1 ratio offered a better balance between functional efficacy and industrial feasibility by minimizing high-cost raw material inputs. These findings suggest that the 1:1 mixed extract is a highly viable and sustainable candidate for the nutricosmetic industry.

P5-03

Improvement of protein quality and functional properties of oats through edible mushroom mycelial inoculation

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This study evaluated the effects of edible mushroom mycelial inoculation on the protein quality and functional properties of oats. Oats were inoculated with mycelia of Sanghwang (SH), Chaga (CH), Shiitake (SI), and Yellow oyster (YO) mushrooms under solid-state fermentation conditions, followed by analyses of amino acid composition, protein quality, total polyphenol content (TPC), total flavonoid content (TFC), and antioxidant activities. Most amino acid contents increased after mycelial inoculation, with the YO treatment showing the highest total amino acid content (22.42 g/100 g DW). In addition, the YO treatment exhibited the highest branched-chain amino acid, methionine, and PDCAAS values, indicating improved protein quality. In contrast, tryptophan was identified as the first limiting amino acid in the SI treatment, which also showed the lowest PDCAAS value. Functional component analysis showed that the SI and YO treatments had increased extraction yields, TPC, and TFC. The YO treatment exhibited the highest TPC and TFC values at 256.66 mg GAE/100 g DW and 12.77 mg CE/100 g DW, respectively. Antioxidant activities showed trends similar to those of functional components. The YO treatment showed the highest DPPH and ABTS radical scavenging activities, whereas the SI treatment exhibited the strongest ferric reducing antioxidant power. In contrast, the CH treatment showed reduced functional component contents and antioxidant activities, indicating limited effects on functional enhancement. These results suggest that edible mushroom mycelial inoculation is an effective strategy for improving the protein quality and functional properties of oats, and that YO-inoculated oats may serve as a promising functional plant-based protein source for elderly-friendly foods.

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P5-04

Evaluation of anti-oxidant, anti-diabetic and anti-thrombosis activity of different parts of paprika

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Paprika (*Capsicum annuum*) fruits are widely consumed as fresh and processed foods, whereas most non-fruit parts are discarded as agricultural waste. In this study, extracts prepared from paprika fruits, placentas, seeds, leaves, and stems were evaluated for antioxidant, antidiabetic, and antithrombotic activities. Ethanol extraction yields of fruits ranged from 3.3% to 4.4%, while leaves and placentas showed higher yields of 5.29% and 8.01%, respectively. Total polyphenol contents were in the order of stem 〉 leaf 〉 fruit (green 〉 red, pink 〉 orange) 〉 placenta. Leaf extracts exhibited the strongest α-glucosidase inhibitory activity (23.1%). DPPH and ABTS radical scavenging activities were highest in seeds, followed by leaves, placentas, and fruits. Reducing power was highest in stems, followed by placentas, seeds, fruits, and leaves. Nitrite scavenging activity was observed in the order of leaf and stem 〉 seed 〉 placenta 〉 fruit. Unlike hot peppers, paprika extracts showed only weak anticoagulant activity, and no hemolytic activity was observed at concentrations up to 1 mg/mL. These results suggest that underutilized paprika leaves and stems may serve as valuable functional materials with antioxidant and antidiabetic properties.

P5-05

Safety assessment and preventive effects of cheonggukjang (Korean fermented soybean paste) samples with distinct quality characteristics in DSS-induced colitis mice

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Inflammatory bowel disease (IBD) is a chronic inflammatory disorder of the gastrointestinal tract. *cheonggukjang* is a traditional Korean fermented soybean food known for its various health-promoting properties. This study aimed to evaluate the safety and preventive effects of cheonggukjang samples with distinct quality characteristics in a dextran sulfate sodium (DSS)-induced colitis mouse model. Three *cheonggukjang* samples (A, B, and C) with different viable bacterial counts, histamine and tyramine contents, and sodium levels were orally administered to mice at a dose of 500 mg/kg/day for 20 days prior to colitis induction. A positive control group received 5-aminosalicylic acid (5-ASA, 50 mg/kg/day). Colitis was subsequently induced by administration of 5% DSS in drinking water. At the end of the experimental period, colon length was measured as an indicator of colonic inflammation. In addition, spleen and liver weights were recorded to evaluate systemic inflammatory responses and safety-related outcomes. This study was conducted to assess the safety and preventive effects of *cheonggukjang* samples with distinct quality characteristics in a DSS-induced colitis mouse model.

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P5-06

Effects of sulfur-enriched rice on skin immune and inflammatory responses in DNCB-induced atopic dermatitis mouse model

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This study investigated and compared the dietary effects of sulfur-enriched rice (SER) versus normal rice (Rice) on atopic dermatitis (AD) in an animal model. AD-like skin lesions were induced in BALB/c mice using DNCB. The experimental groups were fed diets supplemented with either Rice or SER at concentrations of 5% and 10% for 3 weeks. The experimental results demonstrated that SER provided a superior therapeutic effect in alleviating dermatitis compared to Rice. Serum analysis showed that SER significantly reduced total immunoglobulin E (IgE) levels. Furthermore, dietary SER effectively suppressed the protein expression of pro-inflammatory cytokines, including interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α). Histological analysis (H&E staining) revealed a marked reduction in epidermal thickness and improvement in skin barrier integrity in the SER groups compared to both the AD-induced control (DNCB) and Rice groups. In conclusion, dietary intake of SER, to a greater extent than Rice, ameliorates atopic dermatitis symptoms by modulating systemic immune responses and alleviating skin inflammation, suggesting its high potential as a functional food ingredient.

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P5-07

Korean traditional fermented foods improve eye health-associated indicators in the animal model

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Dry eye disease (DED) is a multifactorial ocular disorder characterized by tear film instability and ocular inflammation. Despite the established health benefits of Korean traditional fermented foods (KTFFs), their effects on eye health remain unexplored. This study aimed to evaluate whether *Cheonggukjang* (CGJ) improves eye health in DED mice. Mice were divided into control (CON), dry eye disease (DED), DED+Omega-3 (ω-3), and DED+CGJ (CGJ). Body weight did not significantly differ among groups. Compared to CON, spleen and liver weight were markedly increased in DED, whereas notably lower in the ω-3 and CGJ than in DED. Compared to CON, tear volume was markedly reduced in DED, but ω-3 and CGJ significantly increased compared with DED. Also, compared with CON, corneal regularity was markedly disrupted in DED, but ω-3 and CGJ showed a marked improvement relative to DED. Moreover, corneal thickness in DED was notably reduced relative to CON, but both ω-3 and CGJ improved corneal thickness compared to DED. Lastly, DED markedly downregulated water channel-related genes (e.g., Aqp5) compared to CON, but ω-3 and CGJ restored those gene expressions. Conclusively, these findings indicate that KTFFs may improve eye health, and further detailed underlying mechanisms need to be investigated.

P5-08

Cheonggukjang enhances gut microbiota-induced SCFA production, alleviating lipid dysmetabolism in white adipose tissue

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Short-chain fatty acids (SCFAs) are important regulators of host energy metabolism, which are markedly reduced in obesity. *Cheonggukjang* (CGJ) improves dysmetabolism in high-fat and high-cholesterol diet (HCFD)-induced obesity, but its roles in modulating SCFA production to attenuate obesity have not been elucidated. This study investigated the effects of CGJ on lipid metabolism in white adipose tissue (WAT) to determine whether these effects are linked to SCFA production and modulation of the gut microbiota. Mice were divided into control (CON), 45% high cholesterol and 1% fat (HCFD), and HCFD with two different CGJ types (TMC24-10 and TCC24-6). Compared to CON, HCFD significantly increased body weight and relative tissue weights of liver and WAT, whereas CGJ showed lower values than HCFD. Notably, CGJ restored HCFD-associated gut microbiota dysbiosis and markedly increased colonic SCFA levels, including acetate, propionate, and butyrate. Furthermore, CGJ strongly altered gene expression involved in lipid metabolism in both WAT, reducing anabolic genes (e.g., Fasn and Acaca) and increasing catabolic genes (e.g., Atgl and Hsl). These findings suggest that CGJ may attenuate obesity by improving lipid metabolism-related gene expression in WAT and promoting colonic SCFA production.

P5-09

Cheonggukjang improves gut health by elevating the fecal acetate level and regulating colonic G protein-coupled receptor in hypercholesterolemia-induced mice

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The hypocholesterolemic effects of *cheonggukjang* (CGJ) by improving cholesterol and bile acid metabolism, and the involvement of gut microbiota, have been well demonstrated; however, the impacts of CGJ on gut microbiota-derived metabolite production and their receptors, G protein-coupled receptors (GPCRs), have not been explored. Thus, this study investigated the hypocholesterolemia effects of CGJ, which is related to the levels of gut microbiota-derived metabolites and colonic GPCRs. Mice were divided into normal diet (ND), high cholesterol+high fat diet (HCFD), and HCFD+CGJ (CGJ). Compared to ND, HCFD increased body weight and colon weight/length ratio, whereas those indicators of CGJ tended to be lower than HCFD. Histological analysis of the colon also showed that HCFD had significant epithelial disruption relative to ND, but CGJ markedly improved these changes compared to HCFD. Moreover, compared to ND, fecal acetate levels were markedly decreased in HCFD, but CGJ improved the production of acetate compared to HCFD. In addition, CGJ upregulated colonic GPR43 gene expression levels compared to HCFD. Overall, these findings indicate that CGJ may improve HCFD-induced intestinal impairment by modulating microbiota-derived metabolites and related gene expression.

P5-10

Cheonggukjang alleviates obesity-induced renal injury through gut microbiota-derived metabolites, improving the antioxidant system

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Obesity contributes to the development of renal injury. As a key gut microbiota-derived metabolite, short-chain fatty acids (SCFA) play a role in kidney health. *cheonggukjang* (CGJ), a traditional Korean fermented food, modulates the gut microbiota and exerts diverse health benefits; however, its effects against obesity-induced renal damage remain unclear. Therefore, this study examined whether CGJ alleviates obesity-induced renal injury by regulating SCFA production. Mice were fed a diet: normal (CON), high-fat (40%), and high-cholesterol (1%) (HFC), and HFC+CGJ (CGJ). Compared to CON, HFC significantly increased body weight and levels of kidney triglyceride (TG) and total cholesterol (TC), but also malondialdehyde (MDA), whereas CGJ significantly lowered these parameters than HFC. Moreover, compared to HFC, CGJ significantly increased renal expression of genes and proteins related to the antioxidant system, including CAT, GPX1, and SOD1. Furthermore, CGJ also increased fecal SCFA production more than HFC, while HFC decreased SCFA levels compared with CON. Importantly, SCFA was positively correlated with the gene expression of the antioxidant system. Overall, CGJ may alleviate obesity-induced renal injury by improving the renal antioxidant system via increasing SCFA production.

P5-11

Ganjang ameliorates colorectal cancer via improving intestinal barrier integrity, mucin release, and gut microbiota-derived metabolite production despite its high salt

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Colorectal cancer (CRC) is a common gastrointestinal cancer that can be promoted by a high salt diet. *Ganjang* (GJ), a traditional Korean fermented food, has anti-cancer effects, while its high salt content has been a concern, and the impact of GJ on gut microbiota-derived metabolite production has not been investigated. This study researched whether the anti-cancer effects of GJ and its role in producing gut microbiota-derived metabolites despite its high salt content. Mice were divided into control (CON), A/D (10 mg/kg AOM+2% DSS), NaCl (A/D+5% NaCl), and GJ (A/D+10 mL/kg GJ in 5% NaCl). Compared with A/D, GJ lowered tumor numbers and improved pathological indicators, whereas NaCl worsened these parameters compared to GJ. Moreover, compared to A/D, GJ significantly increased butyrate (BUT) production, but NaCl markedly decreased BUT level relative to GJ. Also, compared to A/D, GJ markedly elevated gene levels involved in intestinal barrier function (e.g., Occludin and Zo-1) and mucin release (e.g., Muc2 and Muc3), while NaCl reduced these gene levels compared to GJ. Shortly, GJ may attenuate CRC by improving intestinal barrier function and mucin release, which might be associated with gut microbiota-produced BUT, despite its high salt.

P5-12

Comparative analysis of the antithrombotic, antioxidant, and antidiabetic activities of Korean and Chinese *Salvia miltiorrhiza*

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To develop high-value functional food ingredients from *Salvia miltiorrhiza* (Danshen), ethanol extracts of domestic Korean and Chinese Danshen (KD and CD) were evaluated for antithrombotic, antioxidant, and antidiabetic activities, and their chemical compositions were analyzed by GC-MS. KD showed lower lightness (L*) and redness (a*) values than CD, whereas yellowness (b*) was similar. The extraction yield of CD (0.85%) was approximately 1.8-fold higher than that of KD. Both extracts exhibited potent antithrombotic activities through inhibition of thrombin and blood coagulation factors, although no significant inhibition of prothrombin was observed. The extracts also showed strong α-glucosidase inhibitory activity and antioxidant activities, including DPPH radical scavenging, ABTS radical cation scavenging, nitrite scavenging, and reducing power. No hemolytic activity against human erythrocytes was detected up to 1.0 mg/mL. GC-MS analysis identified sucrose, 3,4-dihydroxyphenylglycol, ferruginol, dehydroferruginol, jaboticabin (TMS derivative), and lidocaine as common constituents in all extracts, while several compounds were unique to KD or CD. Overall, KD contained relatively higher levels of compounds associated with antioxidant and antidiabetic activities, whereas CD was enriched in constituents related to anti-inflammatory, antimicrobial, and antiproliferative activities. These results suggest that both KD and CD show significant bioactivities and may serve as valuable functional food and nutraceutical resources targeting diabetes and inflammation.

P5-13

Deer antler extract improves bone microarchitecture in ovariectomized mice

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Osteoporosis is a metabolic bone disease characterized by reduced bone mass and deterioration of bone microarchitecture, leading to an increased risk of fractures. Deer antlers have traditionally been used to promote bone health due to their remarkable bone growth and regenerative capacity. This study evaluated the effects of deer antler water extract (DWE) on osteoblast differentiation and osteoporosis-related bone loss. MC3T3-E1 pre-osteoblast cells were treated with DWE to assess cell viability, ALP activity, mineralization, and osteogenic marker expression. In addition, an ovariectomy (OVX)-induced osteoporosis mouse model was used to evaluate the bone-protective effects of DWE. DWE promoted osteoblast differentiation by increasing ALP activity, mineralization, and the expression of RUNX2, ALP, OPN, and Pro COL I without affecting cell viability. In OVX-induced osteoporotic mice, DWE improved bone microarchitecture by increasing BV/TV and Tb.N while decreasing Tb.Sp. These findings suggest that DWE promotes bone formation and bone homeostasis and may serve as a promising natural product for osteoporosis prevention.

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P5-14

Plum-derived exosome-like nanovesicles enhance intestinal barrier function in DSS-induced acute colitis

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This study investigated the protective effects of plum-derived exosome-like nanovesicles (PNVs) against inflammatory bowel disease (IBD) and gut–liver axis dysfunction. PNVs were isolated from plums and characterized by NTA and TEM. DSS-induced colitis mice and intestinal epithelial cells were used to evaluate the protective effects of PNVs on intestinal injury and gut–liver axis dysfunction. PNVs were successfully isolated with a particle size of 100–200 nm. In DSS-induced colitis mice, PNVs restored colon length, improved epithelial damage and gut microbiota composition, and reduced oxidative stress, intestinal permeability, endotoxemia, and inflammation-related intestinal and liver injury. These findings suggest that PNVs protect the gut–liver axis and may serve as a promising natural therapeutic strategy for IBD. The present study demonstrated that plum-derived PNVs alleviate IBD by improving intestinal barrier function and protecting the gut–liver axis. Their antioxidant and anti-inflammatory activities contributed to the attenuation of both intestinal and hepatic injury. These findings support the potential of PNVs as a natural therapeutic agent for IBD.

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P5-15

Honey- and pollen-derived extracellular vesicles attenuate melanogenesis and promote epidermal regeneration

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The skin functions as a regulated barrier that protects the body from environmental stress while maintaining hydration and tissue homeostasis. Chronic ultraviolet exposure and external insults can increase reactive oxygen species, hyperpigmentation, and delayed epidermal repair. Honey and pollen have antioxidant and regenerative potential, but delivery of their active constituents across the skin remains challenging. Here, honey- and pollen-derived extracellular vesicles (HPEVs) were evaluated as biocompatible nanoscale carriers for skin applications. Isolated HPEVs showed uniform vesicular morphology with mean diameters of 168.5 – 216.5 nm and were efficiently internalized by B16F10 melanoma cells and human skin-associated cell lines without cytotoxicity up to 10 μg/mL. In α-MSH-stimulated B16F10 cells, HPEVs reduced melanogenesis by downregulating MITF and downstream effectors, including tyrosinase and TRP-2. Scratch wound assays in HaCaT cells showed that HPEVs enhanced keratinocyte migration without excessive proliferation. For cosmetic use, HPEVs were incorporated into a CICA cream and showed favorable physicochemical and rheological stability. These findings suggest that HPEVs are promising natural nanocarriers for managing hyperpigmentation and promoting skin regeneration.

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P5-16

Ginger-derived nanovesicles inhibit breast cancer progression by suppressing cell growth and metastatic behaviors

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Breast cancer remains a leading cause of cancer-related mortality worldwide, highlighting the need for therapeutic strategies that are both effective and safe. Although conventional treatments have improved patient outcomes, their use is often limited by adverse effects, drug resistance, and insufficient suppression of metastasis. Plant-derived nanovesicles (PDNVs) have recently emerged as promising bioactive platforms because of their natural origin, biocompatibility, low toxicity, and intrinsic therapeutic potential. In this study, we demonstrate that ginger-derived nanovesicles (GNVs) exert anti-cancer effects against human breast cancer cells by suppressing proliferation, migration, and invasion while promoting apoptotic cell death. Mechanistically, GNVs downregulated invasion-associated proteins, including MMP-2 and MMP-9, suggesting reduced metastatic potential. In addition, GNVs activated the Bax/caspase-3 apoptotic pathway, indicating that apoptosis induction contributes to their anti-cancer activity. Collectively, these findings suggest that GNVs may serve as a safe and multifunctional nanovesicle-based platform and support their potential application as an alternative or complementary strategy for breast cancer treatment.

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P5-17

Aster glehnii-derived nanovesicles suppress melanogenesis in B16F10 cells by modulating tyrosinase-related proteins

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Aster glehnii–derived nanovesicles (AGNVs) were investigated as a potential natural anti–melanogenic material using B16F10 melanoma cells. AGNVs were isolated from Aster glehnii through sequential centrifugation and ultracentrifugation, and their physicochemical properties were evaluated by nanoparticle tracking analysis. The isolated AGNVs showed an average particle size of approximately 188 nm. To assess their biological effects, B16F10 cells were treated with AGNVs under α–melanocyte–stimulating hormone (α–MSH)–induced melanogenic conditions. AGNVs did not show cytotoxicity at the tested concentrations, indicating their applicability for cellular experiments. Under α–MSH stimulation, AGNV treatment reduced melanin accumulation and tyrosinase activity compared with the α–MSH–treated control group. In addition, western blot analysis showed that AGNVs decreased the expression of melanogenesis–related proteins, including tyrosinase, TRP1, and TRP2. These results suggest that AGNVs may attenuate melanogenesis in B16F10 cells by regulating tyrosinase activity and melanogenesis–related protein expression. Therefore, AGNVs could be considered as a promising natural nanovesicle–based material for skin–whitening applications.

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P5-18

Antioxidant activities and immune-enhancing effects of 'Baromi 2' vinegar

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'Baromi 2', a floury rice variety, is suitable for dry milling, making it efficient for rice flour production and food processing. Vinegar is known to have diverse beneficial effects against human diseases, including obesity, blood glucose regulation, etc. In this study, we evaluated the antioxidant activity of 'Baromi 2' vinegar and investigated its immuno-enhancing effects in RAW264.7 macrophages. The total polyphenol content of 'Baromi 2' vinegar was 73.63 μg GAE/g, while the total flavonoid content was 32.67 μg CE/g. ABTS and DPPH radical scavenging activities of 'Baromi 2' vinegar were evaluated at concentrations of 12.5, 25, 50 and 100 μg/mL. The ABTS radical scavenging activities were 4.9%, 9.20%, 19.44% and 36.95%, while the DPPH radical scavenging activities were 9.2%, 21.3%, 43.8% and 69.0%, respectively. Both ABTS and DPPH radical scavenging activities increased in a concentration-dependent manner. Additionally, 'Baromi 2' vinegar at concentrations below 200 ug/ml did not affect the viability of RAW264.7 cells and significantly increased nitric oxide (NO) production at 200 ug/ml. These results suggested that 'Baromi 2' vinegar has potential as a functional fermented food material with antioxidant and immunostimulatory activities.

P5-19

Anti-hair loss mitigates of *Saccharomyces cerevisiae*-fermented Laminaria japonica in oxidative stress-induced follicle dermal papilla cells

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Oxidative stress–induced inflammation and apoptosis in dermal papilla cells are closely associated with hair follicle degeneration and the progression of hair loss. This study investigated the antioxidant, anti–inflammatory, and hair growth–promoting effects of *Saccharomyces cerevisiae*–fermented *Laminaria japonica* (KelpGo). Antioxidant assays demonstrated that KelpGo significantly increased superoxide dismutase (SOD) activity. Anti–inflammatory evaluation using lipopolysaccharide–stimulated macrophages revealed reduced nitric oxide production together with suppressed expression of inducible nitric oxide synthase (iNOS) and cyclooxygenase–2 (COX–2). In H_2O_2–stimulated human follicle dermal papilla cells, KelpGo attenuated oxidative stress–induced cytotoxicity in a concentration–dependent manner, reduced IL–6 and IL–8 secretion, inhibited NF–κB phosphorylation, restored insulin–like growth factor–1 (IGF–1) expression, and enhanced AKT phosphorylation. KelpGo further suppressed apoptosis by decreasing Bax expression and restoring total caspase–3 expression. Collectively, these findings suggest that KelpGo modulates key pathways implicated in hair loss through antioxidant, anti–inflammatory, and cytoprotective activities while promoting hair growth–associated signaling.

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P5-20

Protective effects of *Elsholtzia flava* (Benth.) Benth. against LPS-induced pulmonary inflammation via inhibition of nitric oxide production

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The lung is continuously exposed to the external environment and plays a central role in inflammatory responses. Although plants of the genus Elsholtzia have traditionally been used to treat colds, coughs, and inflammation, the pharmacological activity of *Elsholtzia flava* (Benth.) Benth. remains poorly understood. This study investigated the protective effects of *E. flava* ethanol extract (EFE) against lipopolysaccharide (LPS)–induced lung inflammation in vitro and in vivo. In LPS–stimulated RAW 264.7 macrophages and BEAS–2B bronchial epithelial cells, EFE suppressed nitric oxide production and reduced inducible nitric oxide synthase (iNOS), interleukin–6 (IL–6), and C–X–C motif chemokine ligand 2 (CXCL2) expression through inhibition of NF–κB signaling. EFE also reduced intracellular reactive oxygen species (ROS) accumulation and promoted NRF2–associated antioxidant responses. In an LPS–induced mouse model, EFE attenuated histopathological lung injury and decreased IL–6 and TNF–α mRNA levels as well as iNOS and p65 protein levels in lung tissue. These findings suggest that EFE exerts anti–inflammatory and antioxidant effects through regulation of iNOS and ROS production and may serve as a functional food ingredient for inflammation–associated respiratory diseases.

P5-21

Antioxidant and antithrombotic activities of *Abies nephrolepis* extracts

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Abies nephrolepis is an evergreen conifer distributed in the Korean Peninsula, northeastern China, and eastern Siberia. *Abies koreana*, a closely related species, is morphologically similar to *A. nephrolepis*. The cones of *A. koreana*, known as Baksongsil in traditional medicine, have been used to treat hypertension, headache, dizziness caused by liver–yang hyperactivity, as well as menstrual irregularities, leukorrhea, and uterine bleeding. In contrast, *A. nephrolepis* has traditionally been used only as timber for construction, tools, and boards. In this study, we investigated the antioxidant and antithrombotic activities of *A. nephrolepis* extracts to explore their potential value as functional bioactive materials. The total polyphenol content of the leaf and branch extracts was determined. The leaf extract contained 120.82 mg/g, while the branch extract contained 101.06 mg/g. In both the electron–donating ability assay and the ABTS radical scavenging assay, antioxidant activity increased in a concentration–dependent manner. The leaf extract, which had a higher total polyphenol content, tended to show stronger antioxidant activity. In contrast, the branch extract exhibited higher xanthine oxidase inhibitory activity. The antithrombotic activity of A. nephrolepis extracts was evaluated by measuring thrombin time, prothrombin time, and activated partial thromboplastin time. The extracts showed strong antithrombotic activity, prolonging clotting time by more than 15–fold compared with the untreated control. These results suggest that *A. nephrolepis* extracts have potential as antioxidant functional materials and antithrombotic agents.

P5-22

Biotransformation of licorice by *Leuconostoc mesenteroides* enhances skin protective activities

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Ultraviolet B (UVB) irradiation and advanced glycation end-products (AGEs) accelerate skin inflammaging, the premature aging triggered by chronic inflammation. This study investigated the anti-inflammatory effects of fermented licorice extract (FLE) produced using *Leuconostoc mesenteroides* and analyzed fermentation-induced metabolic changes through untargeted metabolomics. The cellular anti-inflammatory activities of unfermented licorice extract (ULE) and FLE were evaluated in HaCaT keratinocytes exposed to glyoxal-derived AGEs (GO-AGEs) and UVB irradiation. At 10 μg/mL, FLE reduced interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) production by 46% and 52%, respectively, and suppressed prostaglandin E2 (PGE_2) secretion, receptor of AGEs (RAGE) expression, nuclear factor-kappa B (NF-κB) translocation, and mitogen-activated protein kinase (MAPK) phosphorylation. Untargeted metabolomics revealed 42 metabolites that changed during fermentation. Glycosylated compounds, including glycyrrhizin, decreased significantly after fermentation, whereas their deglycosylated aglucones such as 18β-glycyrrhetic acid and isoliquiritigenin increased markedly. Correlation analysis showed strong positive associations between these metabolites and anti-inflammatory activity, suggesting deglycosylation as a key mechanism underlying the enhanced bioactivity of FLE. In conclusion, these findings demonstrate that fermentation improves the functional properties of licorice and highlights the potential use of FLE as a promising bioactive ingredient for managing glycation- and UV-induced skin inflammation.

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P5-23

Protective effects of live and heat-killed *Limosilactobacillus fermentum* ANC4 against dexamethasone-induced skeletal muscle atrophy

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Prolonged glucocorticoid administration accelerates skeletal muscle wasting by promoting protein degradation and suppressing regenerative capacity. We investigated whether live or heat-killed *Limosilactobacillus fermentum* ANC4 (KCTC 15072BP), isolated from traditional Korean *makgeolli*, could protect against dexamethasone (Dex)-induced muscle atrophy in a mouse model. Both forms of *L. fermentum* ANC4 restored grip strength and treadmill endurance to levels comparable to the positive control (oxymetholone), with significant preservation of gastrocnemius (GCM) mass. Mechanistically, the live form preferentially suppressed glucocorticoid receptor and Atrogin-1 expression, whereas the heat-killed form more robustly upregulated myosin heavy chain, reflecting complementary roles in attenuating proteolysis and promoting structural regeneration. Histologically, muscle fiber cross-sectional area was restored and collagen deposition was markedly reduced, representing an antifibrotic property previously unreported within this genus. Hepatic and renal injury scores also improved across all treatment groups. These findings suggest that *L. fermentum* ANC4 mitigates muscle atrophy by dampening catabolic signaling while reinforcing myogenic repair, supporting its potential as a probiotic or postbiotic intervention for the preservation of muscle mass and function.

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P5-24

Effects of dried laver (*Porphyra yezoensis*) extracts on muscle atrophy in C2C12 cells

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This study aimed to evaluate the anti-atrophic effects of dried laver (*Porphyra yezoensis*) extracts in dexamethasone-induced C2C12 myotubes. The extracts were prepared using hot water (LW) and subcritical water (LS) extraction methods. In dexamethasone-induced C2C12 myotubes, the dexamethasone-treated (DEX) group showed a marked reduction in myotube thickness and length compared with the control (CN) group. Conversely, LS restored myotube diameter in a dose-dependent manner. LW also increased myotube diameter; however, no significant difference was observed compared with the DEX group. LS upregulated the expression of myogenic markers, such as myogenic differentiation 1 (MyoD), myogenin (MyoG), and myosin heavy chain (MHC), while decreasing the expression of atrophy-related markers, including Myostatin and muscle RING-finger protein-1 (MuRF-1). Disease/function and canonical pathway analyses indicated a tendency toward muscle atrophy-related pathways. These findings suggest that laver extracts, particularly LS, ameliorate dexamethasone-induced muscle atrophy by upregulating myogenesis and inhibiting atrophic factors. Therefore, LS may have potential as a therapeutic agent for muscle atrophy.

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P5-25

Saccharina japonica ameliorates dexamethasone-induced muscle atrophy via the Akt/mTOR/FoxO3α signaling pathway in C2C12 myotubes

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In this study, we investigated suppressive effects of *Saccharina japonica* extracts (KW and KS) on dexamethasone-induced muscle atrophy in C2C12 cells. The dexamethasone-only (Dex) group showed reduced myotube diameter compared to the control (Ctrl) group; however, KW and KS extracts dose-dependently restored myotube diameter. High-dose KW (100 μg/mL) significantly increased myogenic gene expression, such as myogenic factor 5 (Myf5), while decreasing atrophy-related genes, including forkhead box O3α (FoxO3α) compared to the Dex group. To explore the underlying mechanisms, protein expression was evaluated at the most effective concentration (100 μg/mL). KW increased IGF-1 expression and activated the phosphoinositide 3-kinase (PI3K)/protein kinase B (Akt) pathway, thereby promoting mammalian target of rapamycin (mTOR) and FoxO3α phosphorylation activation. Furthermore, KW not only downregulated myostatin, atrogin-1, and muscle-specific RING finger protein 1 (MuRF-1), but also upregulated myogenic markers, including myogenic differentiation 1 (MyoD), myogenin (MyoG), and myosin heavy chain (MHC). These findings suggest that KW ameliorates dexamethasone-induced muscle atrophy via the Akt/mTOR/FoxO3α signaling pathway and may serve as a potential natural therapeutic agent.

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P5-26

감초 지상부의 기능성 소재 활용을 위한 품종별 항염 활성 평가

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천연 유래 기능성 소재에 대한 관심이 증가함에 따라 식물자원의 고부가가치 활용 필요성이 커지고 있다. 감초(*Glycyrrhiza uralensis* Fischer)는 다양한 생리활성 물질을 함유한 약용작물로 알려져 있으나, 주로 뿌리 부위가 이용되고 재배 과정에서 발생하는 지상부(잎, 줄기)의 활용은 제한적인 실정이다. 본 연구에서는 감초 지상부 추출물의 항염 활성을 품종별로 평가하여 기능성 소재로서의 활용 가능성을 검토하고자 하였다. 실험 재료는 '원감' 및 '다감' 품종의 지상부를 사용하였으며, RAW 264.7 대식세포를 이용하여 세포독성(MTT assay), nitric oxide (NO) 생성 억제능 및 Interleukin-6(IL-6) 생성 억제능을 평가하였다. 세포독성 평가 결과, 두 품종의 지상부 추출물은 1,000 μg/mL 농도까지 세포생존율이 100% 이상으로 나타나 세포독성을 보이지 않았다. 또한 LPS로 유도한 NO 및 IL-6 생성량은 시료 처리 농도가 증가함에 따라 감소하였다. 특히 1,000 μg/mL 처리 시 '원감' 지상부 추출물의 NO 및 IL-6 생성량은 각각 0.33 μM 및 1,771.4 pg/mL로 감소하였고, '다감' 지상부 추출물은 각각 0.44 μM 및 2,146.8 pg/mL로 나타났다. 이러한 결과는 감초 지상부 추출물이 염증 관련 인자인 NO와 IL-6의 생성을 억제하는 항염 활성을 가지며, '원감' 품종이 '다감' 품종보다 상대적으로 높은 활성을 나타냄을 시사한다. 따라서 감초 지상부는 기능성 소재로 활용될 가능성이 있으며, 본 연구 결과는 농산부산물의 고부가가치 활용을 위한 기초자료로 활용될 수 있을 것으로 판단된다.

P5-27

Functional cosmetic activity of *Aria alnifolia* extracts

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This study evaluated the antioxidant activity and skin-related enzyme inhibitory effects of extracts from *Aria alnifolia* (syn. *Sorbus alnifolia*) to assess its potential for industrial application. Four extracts prepared using different plant parts and solvents were analyzed for total polyphenol content, antioxidant capacity, and skin-related bioactivities. The 70% and 75% ethanol extracts exhibited high total polyphenol contents ranging from 124.81 to 158.30 mg/g GAE, whereas the hot-water branch extract showed a markedly lower content (40.82 mg/g GAE). Antioxidant activities measured by electron-donating ability and ABTS radical scavenging assays increased in a concentration-dependent manner for all extracts, although no significant differences were observed according to polyphenol content. Enzyme inhibition assays revealed that the 75% ethanol extract showed negligible tyrosinase inhibitory activity and approximately 20% elastase inhibition at high concentrations. The same extract exhibited about 50% astringent activity at high concentration. These results suggest that *A. alnifolia* extracts possess potential as functional ingredients for cosmetic and skin care applications.

P5-28

A liquid-based drosophila melanogaster platform for *in vivo* screening of natural product extracts

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Reducing reliance on vertebrate animal models has increased demand for alternative in vivo screening systems that align with the 3Rs principles of Replacement, Reduction, and Refinement. *Drosophila melanogaster* (*D. melanogaster*) is a useful miniaturized *in vivo* model for the preliminary evaluation of functional bioresources, owing to its short life cycle, genetic tractability, low maintenance cost, and evolutionarily conserved disease-relevant pathways. However, extract-supplemented solid diets often result in variable ingestion among individuals, which may compromise the reproducibility of screening outcomes. In this study, we established a standardized liquid-based administration platform for rapid screening of natural product extracts in *D. melanogaster*, using Sample A as a representative extract. Adult male and female w1118 flies were administered Sample A at 100, 200, 500, or 1,000 μg/mL for 24 h. The screening endpoints included survival, dye-based ingestion verification, and locomotor function. Survival was assessed at 4, 20, and 24 h using 30 flies per sex. Liquid intake was evaluated using a Blue No. 1 dye-supplemented solution with 10 flies per sex, and locomotor function was examined using a climbing assay with 20 flies per sex in three independent replicates. Sample A-treated flies showed 100% survival in both sexes across all tested concentrations and time points, indicating no acute lethality under the present exposure conditions. The dye-based assay verified liquid ingestion across concentrations, suggesting that Sample A did not markedly interfere with liquid feeding. In addition, the climbing assay revealed no overt locomotor impairment, indicating the absence of apparent behavioral toxicity after 24 h exposure. These findings demonstrate the feasibility of a liquid-based D. melanogaster administration platform as a practical and reproducible approach for preliminary in vivo screening of natural product extracts. This platform provides a methodological basis for selecting non-toxic candidate materials prior to downstream disease-model-based efficacy validation of functional bioresources.

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P5-29

Anti-oxidant and immunomodulatory activities of extracts from sprout peanut (*Arachis hypogaea* L.)

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Sprout peanuts (*Arachis hypogaea* L.) are known to contain various bioactive compounds, including coumaric acid and amino acids. This study aimed to evaluate the anti-oxidant and macrophage-mediated immunomodulatory activities of sprout peanut extracts. The extracts were prepared by varying water extraction time (1, 2, and 3 h), water extraction temperature (50, 70, and 90℃), and ethanol concentration (25%, 50%, and 75%). Coumaric acid content was higher in water extracts, with 1,194 and 1,061 μg/g in the 50℃ and 90℃ water extracts, respectively. Anti-oxidant activity was evaluated using ABTS and DPPH radical scavenging assays, and all extracts showed radical scavenging activity in a dose-dependent manner. Notably, the 75% ethanol extract exhibited the highest anti-oxidant activity, with ABTS and DPPH radical scavenging activities of 90.9% at 250 μg/mL and 75.2% at 1,000 μg/mL, respectively. To assess the immunomodulatory activity, NO production was measured in RAW 264.7 macrophages. Water extract-treated groups significantly increased NO production. Based on these results, sprout peanut extracts may serve as functional food materials with anti-oxidant activity and immunomodulatory potential.

P5-30

Phenolic compounds and antioxidant activity of spent coffee ground extracts according to different extraction methods

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Coffee is a popular and widely consumed beverage worldwide. Spent coffee grounds (SCG), a by-product of coffee processing, are discarded in quantities exceeding 6 million tons annually. SCG contain various polyphenols, dietary fiber, and protein, suggesting considerable potential as functional food ingredients. This study aimed to evaluate the feasibility of utilizing SCG as a functional food material. To this end, the total phenolic content (TPC) and antioxidant activity of extracts obtained by using ultrasound-assisted extraction (UAE), autoclave extraction (AE), and ethanol extraction (EE) were compared, and chlorogenic acid and gallic acid content were quantified using HPLC. TPC was the highest in the EE (232.42 mg GAE/g) and the lowest in the UAE (116.62 mg GAE/g). EE showed the highest DPPH (85.02%) and ABTS (70.84%) radical scavenging activities at concentration of 500 μg/mL. Chlorogenic acid content of the EE (21.06 mg/g) was higher than that of the AE (14.24 mg/g) and UAE (13.21 mg/g). Gallic acid content was also the highest in the EE at 4.06 mg/g. These results suggest that EE yields SCG extract with superior TPC and antioxidant activity, indicating strong potential for application as a functional food ingredient.

P5-31

Impact of polystyrene microplastics on *in vitro* lung exposure

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Microplastics (MPs) are ubiquitous environmental pollutants that have attracted considerable attention due to their potential ecological and human health impacts. In addition to their adverse effects on marine ecosystems, MPs may influence cellular and physiological processes in humans. Although the health risks associated with MP exposure remain incompletely understood, direct contact with MPs has been reported to induce biological responses at the cellular level. This study investigated the effects of primary polystyrene microplastic particles (MP-PS) on human cells *in vitro*. Our findings demonstrate that MP-PS particles function as immunomodulatory agents, promoting the secretion of cytokines and chemokines in a manner dependent on both particle size and exposure concentration.

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P5-32

Effects of Euonymus alatus leaf extract on apoptosis of triple-negative breast cancer cells

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Triple-negative breast cancer (TNBC) is an aggressive subtype of breast cancer with limited therapeutic options and poor prognosis. This study investigated the apoptosis-inducing effects of *Euonymus alatus* leaf extract in human TNBC MDA-MB-231 cells. The phytochemical composition of *E. alatus* leaf extract was characterized by high-performance liquid chromatography (HPLC), which identified rutin, quercetin, and ellagic acid as major constituents. The anti-cancer activity of E. alatus leaf extract was evaluated using the sulforhodamine B (SRB) assay, morphological observations, Hoechst 33258 staining, and western blot analysis. Treatment with E. alatus leaf extract significantly reduced the viability of MDA-MB-231 cells in a concentration-dependent manner. Morphological examination revealed cell shrinkage and decreased cell density, while Hoechst 33258 staining demonstrated chromatin condensation and apoptotic body formation, indicating apoptosis induction. Furthermore, western blot analysis showed increased expression of the pro-apoptotic protein Bax and decreased expression of the anti-apoptotic protein Bcl-2, along with reduced levels of pro-caspase-3, -8, and -9 and enhanced PARP cleavage. These findings suggest that E. alatus leaf extract induces apoptosis in TNBC cells and may have potential as an anti-cancer agent.

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P5-33

Antioxidant and anti-aging effects of extracts from resources produced in the Jeonbuk State

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With the rapid onset of an aging society, healthy aging has garnered significant social interest. To address this trend, this study selected seven natural resources well-known for their anti-aging properties from literature and prepared their extracts using water and ethanol to evaluate their antioxidant and anti-aging activities. In the antioxidant assays, the hot water extract of Petasites japonicus demonstrated overall superior efficacy, yielding a total polyphenol content of 111.47±0.86 mg/g, a total flavonoid content of 20.93±1.75 mg/g, and IC50 values of 166.12±0.99 μg/mL for DPPH radical scavenging activity and 410.08±1.58 μg/mL for ABTS radical scavenging activity. Regarding the evaluation of aging-related diseases, the ethanol extract of Senna tora exhibited excellent potential, showing an acetylcholinesterase inhibitory activity of 69.28±2.57% and a protective effect against oxidative stress-induced apoptosis in SH-SY5Y cells (94.71±0.9%). These findings are expected to serve as foundational data for utilizing these materials as ingredients for "healing food" in Jinan-gun, which aims to establish itself as a therapeutic and healing city.

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P5-34

Multifunctional skin-improving activities of *Artemisia fukudo* Makino extract for functional cosmetics

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Artemisia fukudo (*A. fukudo*) Makino cultivated under general soil conditions was evaluated for its skin-related functional activities to determine its potential as a functional cosmetic ingredient. The aerial parts of *A. fukudo*, collected from Hampyeong, Jeollanam-do, were freeze-dried and hot-water extracted at 55℃ (designated as *A. fukudo* Makino extract, AFM-E). The resulting extract was assessed for its in vitro whitening, anti-inflammatory, anti-wrinkle, and moisturizing activities. AFM-E dose-dependently inhibited mushroom tyrosinase activity with a maximum inhibition rate of 52.59% at 100 μg/mL, suggesting a whitening effect via the suppression of melanin synthesis. Additionally, AFM-E reduced nitric oxide (NO) production by up to 75.64% in LPS-stimulated RAW 264.7 macrophages, indicating significant anti-inflammatory activity. In UV-irradiated human dermal fibroblasts, it suppressed matrix metalloproteinase-1 (MMP-1) expression by up to 50.53%, implying anti-wrinkle potential through the inhibition of collagen degradation. Furthermore, AFM-E increased aquaporin-3 (AQP-3) expression by up to 119.01% in HaCaT keratinocytes, demonstrating moisturizing activity related to skin hydration regulation. These findings indicate that cultivated *A. fukudo* possesses multifunctional properties by simultaneously modulating key skin-related mechanisms, including melanogenesis, inflammatory responses, collagen degradation, and water homeostasis. Overall, these results support the high potential of AFM-E as a premium functional cosmetic ingredient and provide a robust scientific basis for its further industrial development.

P5-35

갈색거저리(*Tenebrio molitor*) 유충 유래 오일의 항염증, 미백 및 피부 유해균에 대한 항균 활성 평가

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갈색거저리(*Tenebrio molitor*) 유충 유래 오일(Mealworm oil, MO)은 가공단계(착유)에서 생산되지만 대부분 활용되지 못하며 이에 대한 연구 또한 제한적이다. 본 연구에서는 MO의 항염증, 미백 및 항균 활성을 평가하여 기능성 소재로서의 활용 가능성을 검토하였다. RAW 264.7 세포를 이용한 세포독성 평가에서 MO 250 – 1,000 μg/mL 처리군은 100% 이상의 세포생존율을 보여 독성이 없었으며, LPS 유도 염증 모델에서 nitric oxide (NO) 생성을 농도 의존적으로 억제하여 항염증 활성을 나타냈다. Tyrosinase 저해 활성은 농도 증가에 따라 향상되었으며, 6,000 μg/mL 처리군에서 ascorbic acid와 유사한 수준을 보였다. 항균 활성 평가에서는 *Staphylococcus aureus*, *Staphylococcus epidermidis* 및 *Cutibacterium acnes*에 대해 농도 의존적인 생육 저해 효과가 확인되었다. 따라서 MO는 항염증, 미백 및 항균 기능을 갖는 천연 유래 기능성 소재로 활용 가능성이 높은 것으로 판단된다.

P5-36

Development of an AI-based automatic classification model for representative foods in processed food databases

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The classification of representative foods in processed food databases is a fundamental element that supports consumers' food selection in nutritional intake assessments and AI-driven dietary services. However, the current assignment process, based on food names and category hierarchies, lacks clearly defined criteria, resulting in insufficient consistency. This limitation is increasingly critical as novel processed foods continue to emerge in the market. To address this, the present study developed an AI-based model for automatic classification of representative foods using the processed food database publicly released by the Ministry of Food and Drug Safety (MFDS) of Korea, and evaluated its classification accuracy. Eighty percent of the dataset was used for training, while the remaining 20% served as test data to validate model performance. The proposed model is expected to enhance consistency in representative food assignment for newly emerging processed foods, contributing to effective utilization of the national nutrition database. It is also anticipated to provide a practical foundation for advancing Korea's voluntary nutrition labeling policy and improving the accuracy of AI-based dietary intake assessment services.

P5-37

Comparison of nutritional and functional components in green and white asparagus by harvest time and part

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This study was conducted to investigate differences in the general composition, vitamin C and rutin content, and antioxidant properties of asparagus based on harvest time, cutting location, and whether the skin was removed. The test materials consisted of green asparagus, white asparagus, and peeled white asparagus, which were divided into upper and lower sections for analysis. The results showed that, overall, the upper samples tended to have higher protein and antioxidant-related indicators than the lower samples, while the lower samples tended to have higher carbohydrate content. Regarding vitamin C content, green asparagus had the highest level in the April samples at 0.136 g/100 g, followed by white asparagus (0.114 g/100 g), peeled white asparagus (0.114 g/100 g), and peeled white asparagus (0.099 g/100 g). Rutin content was also highest in green asparagus at 448.20 mg/100 g, followed by green asparagus tips at 79.36 mg/100 g, white asparagus at 34.02 mg/100 g, white asparagus tips at 7.63 mg/100 g, and peeled white asparagus at 5.96 mg/100 g. Regarding antioxidant indicators, the tops of green asparagus exhibited high total flavonoid content and DPPH scavenging activity in both harvest periods, demonstrating excellent functional properties.

P5-38

Polyphenol-rich *Staphylea bumalda* leaf extract alleviates metabolic dysfunction across multiple metabolic organs in high-fat diet-fed mice through cytokine-mediated regulation

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Metabolic dysfunction induced by high-fat diets and excessive caloric intake represents a major global health challenge, contributing to obesity, insulin resistance, hepatic steatosis, and skeletal muscle impairment. This condition is characterized by dysregulation across multiple metabolic organs, including the gut, liver, adipose tissue, and skeletal muscle. In this study, we investigated the effects of polyphenol-rich *Staphylea bumalda* leaf extract (SBE) on high-fat diet (HFD)-induced metabolic dysfunction using an integrated multi-organ analysis. Oral administration of SBE significantly improved lipid metabolism and reduced lipid accumulation in hepatic and adipose tissues in HFD-fed mice. SBE also attenuated intestinal inflammation and restored barrier integrity, while enhancing muscle homeostasis by regulating the balance between protein synthesis and degradation in skeletal muscle. These findings indicate that SBE exerts coordinated regulatory effects across multiple metabolic organs rather than acting on a single target pathway. Furthermore, LC-MS/MS-based phytochemical profiling revealed diverse phenolic constituents that may contribute to its biological activity. Collectively, these results demonstrate that SBE ameliorates HFD-induced metabolic dysfunction through multi-organ metabolic regulation and highlight its potential as a polyphenol-rich functional resource for metabolic health.

P5-39

Anti-inflammatory activity of *Toxicodendron sylvestre* leaf extract *in vitro* and *in vivo*

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In traditional Chinese medicine, *Toxicodendron sylvestre* has been used as a folk remedy for managing inflammation and swelling. This study investigated the effects of the *T. sylvestre* leaf extract (TSLE) on lipopolysaccharide (LPS)-induced inflammation in RAW 264.7 cells and 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced ear edema mice. Firstly, TSLE significantly inhibited LPS-stimulated NO, ROS, and PGE2 production in a dose-dependent manner in RAW 264.7 cells. Additionally, it markedly suppressed the expression of pro-inflammatory cytokines and enzymes in a dose-dependent manner in LPS-stimulated RAW 264.7 cells. Furthermore, TSLE significantly downregulated NF-κB and ERK activation in LPS-stimulated RAW 264.7 cells. The *in vivo* therapeutic efficacy of TSLE was validated in a mouse model of ear edema following topical administration at 50 and 100 μg/ear. As a result, TSLE significantly inhibited swelling, promoted inflammatory cell infiltration in the dermis, and reduced pro-inflammatory cytokine and enzyme levels in the TPA-induced ear edema mice. TSLE has effective anti-inflammatory activities in vitro and in vivo. Therefore, TSLE is a potential natural therapeutic resource for treating inflammatory diseases.

P5-40

Bioactivities of bamboo leaf extracts sequentially fermented by mushroom mycelia and lactic acid bacteria

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Recently, the need for safe and naturally derived functional materials for canine dental care has increased. This study evaluated the antioxidant, cytotoxic, and anti-inflammatory activities of bamboo leaf extracts primarily fermented with mushroom mycelia (*Flammulina filiformis*, *Phellinus linteus*, *Pleurotus ostreatus*) and secondarily with *Lactobacillus brevis* or *Lactobacillus plantarum*. In general, fermented *L. plantarum* samples exhibited higher total polyphenol contents. Specifically, the fermented *F. filiformis* by *L. plantarum* combination reached a maximum value of 50.31 ± 0.75 mg GAE/g, whereas the fermented samples using *L. brevis* were yielded 46.89 ± 0.72 mg GAE/g. Furthermore, *F. filiformis* fermentation samples presented the highest DPPH radical scavenging activity of 74.9% at 500 μg/mL. Interestingly, among the fermented *P. linteus* samples, L. brevis showed a higher activity of 59.4% compared to 49.0% for *L. plantarum*. In RAW 264.7 cells, although the fermented *F. filiformis* by *L. plantarum* significantly inhibited nitric oxide (NO) production, it induced cytotoxicity. In contrast, the fermented *P. linteus* by *L. plantarum* effectively suppressed NO without affecting cell viability. Therefore, while the F. filiformis samples displayed the highest antioxidant activity, the fermented *P. linteus* by *L. plantarum* is considered a more suitable material for canine dental care due to its non-toxic anti-inflammatory properties.

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P5-41

Enhancement of functional properties of fermented *Phyllostachys nigra* var. *henonis* leaf extracts by mushroom mycelium

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Jeonnam is Korea's main *Phyllostachys nigra* var. *henonis* producer, but many leaves are discarded due to underutilization. *P. nigra* var. *henonis* leaves possess various health benefits, making them excellent candidates for functional materials. This study aimed to enhance the functional properties of *P. nigra* var. *henonis* leaves through mushroom mycelium fermentation and evaluate their potential as functional ingredients. *P. nigra* var. henonis leaf hot-water extracts (PNHE) were adjusted to solid contents of 0.5%, 1%, and 3% (w/v) and fermented with *Pleurotus ostreatus*, *Flammulina velutipes*, and *Phellinus linteus*. The content of ergosterol, β-glucan, and total polyphenols were analyzed after fermentation. The lyophilized yield increased proportionally with increasing solid content. In contrast, ergosterol and β-glucan contents declined as the solid content increased. In particular, *F. velutipes* exhibited the highest ergosterol (1,518.61 mg%) and β-glucan content (14.33%) at 0.5% PNHE. TPC was highest in *F. velutipes*, reaching 67.5 mg GAE/g at 3% PNHE. Mushroom mycelium fermentation significantly alters the functional properties of PNHE depending on mushroom strain and solid content. Notably, *F. velutipes* fermentation is promising for enhancing the ergosterol, β-glucan, and TPC of PNHE, which will contribute to increasing the utilization of bamboo leaves.

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P5-42

Whitening activity of fermented Stachys sieboldii by *Hericium erinaceus* mycelia and the anti-melanogenic mechanism of acteoside

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Hyperpigmentation is caused by excessive melanin synthesis in melanocytes, increasing the demand for safe and effective natural whitening agents. In this study, *Stachys sieboldii* hot-water extract was fermented with four mushroom mycelia to enhance its biological activity. Among the tested strains, *Hericium erinaceus* fermentation exhibited the strongest inhibitory effects on melanin synthesis and tyrosinase activity in α-MSH-stimulated B16F10 melanoma cells. The active ethyl acetate fraction was purified using MPLC and LC-MS, and the major active compound was identified as acteoside by NMR and LC-MS/MS analyses. Acteoside significantly inhibited melanin production and intracellular tyrosinase activity in a dose-dependent manner without cytotoxicity. Western blot analysis demonstrated that acteoside reduced the expression of microphthalmia-associated transcription factor (MITF), tyrosinase, tyrosinase-related protein-1 (TRP-1), and TRP-2. Transcriptome analysis revealed 298 upregulated and 461 downregulated differentially expressed genes. KEGG pathway enrichment indicated that acteoside suppresses melanogenesis through regulation of the cAMP and WNT signaling pathways, leading to reduced MITF activity and subsequent downregulation of melanogenic genes. These findings suggest that acteoside derived from *H. erinaceus*-fermented *S. sieboldii* possesses potent anti-melanogenic activity and may serve as a promising natural whitening ingredient. Furthermore, mushroom mycelial fermentation represents an effective bioconversion strategy for enhancing the functionality of plant-derived materials.

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P5-43

Evaluation of antioxidant activity of water and ethanol extracts of tea flowers

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This study aimed to evaluate the potential of tea flowers as functional antioxidant materials by comparatively analyzing the total polyphenol content and antioxidant activity of water and ethanol extracts. The total polyphenol content of the water extract was relatively low, ranging from 8.10% to 8.77%, whereas ethanol extraction generally resulted in higher polyphenol levels. Among the tested extraction conditions, the 30% ethanol extract obtained after 2 h of extraction exhibited the highest total polyphenol content, reaching 23.03%. The DPPH radical scavenging activity of the water extract ranged from 54.6% to 65.9%, while extracts prepared with ethanol concentrations of 30% or higher showed markedly enhanced antioxidant activity, ranging from 70.1% to 85.7%. In particular, extracts prepared with 20 – 30% ethanol, which contained relatively high levels of total polyphenols, tended to exhibit improved radical scavenging activity, suggesting that phenolic compounds may contribute substantially to the antioxidant capacity of tea flower extracts. These findings demonstrate that tea flowers possess significant potential as natural antioxidant resources and may be utilized as functional materials for food, cosmetic, and related bioindustrial applications.

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P5-44

Black rice and bran fermentate ameliorate palmitate-induced muscle atrophy in C2C12 myotubes

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Sarcopenia is an age-related condition characterized by progressive loss of skeletal muscle mass and function. Therefore, considerable efforts have been made to identify functional ingredients that can prevent or attenuate muscle atrophy. Black rice and rice bran fermentate (BRRB-F) contains bioactive compounds with antioxidant and metabolic regulatory properties, and fermentation may enhance their functionality. This study evaluated the cytoprotective and anti-atrophic effects of BRRB-F in palmitate-treated C2C12 myotubes. Differentiated C2C12 myotubes were treated with palmitate to induce an atrophy-like condition and subsequently exposed to various concentrations of BRRB-F. Cell viability, fusion index, myotube diameter, and muscle atrophy-related parameters were evaluated. BRRB-F exhibited no cytotoxicity and significantly restored palmitate-induced reductions in cell viability. In addition, BRRB-F dose-dependently improved fusion index and myotube diameter. These findings suggest that BRRB-F may alleviate palmitate-induced myotube atrophy and support its potential as a functional ingredient for improving skeletal muscle health.

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P5-45

Comparative analysis of the antioxidant activities of water and ethanol extracts from *Adenophorae Remotiflori* Radix

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Adenophorae Remotiflori Radix (ARR) is a traditional medicinal herb widely used in East Asia for the treatment of respiratory and inflammatory disorders. This study evaluated the phytochemical contents and antioxidant activities of water (ARW) and 70% ethanol (ARE) reflux extracts of ARR. The total polyphenol content was higher in ARE (6.42 mg/g) than in ARW (3.86 mg/g). However, in the DPPH radical scavenging assay, ARW exhibited greater activity (62.96%) than ARE (26.79%) at 2.0 mg/mL. In the ABTS radical scavenging assay, ARW and ARE showed scavenging activities of 50.77% and 39.27%, respectively. ARW also demonstrated greater SOD-like activity, reaching 19.76% at 2.0 mg/mL. Furthermore, tyrosinase inhibitory activities were observed in both extracts, with inhibition rates of 39.15% for ARW and 35.13% for ARE. These findings indicate that ARR extracts possess antioxidant and tyrosinase inhibitory activities, with ARW generally exhibiting superior biological activity despite its lower polyphenol content. Therefore, ARR extracts may have potential as natural functional ingredients for cosmetic applications.

P5-46

The study of antioxidant activities of *R. uniflorum* extracts

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Rhaponticum uniflorum, a perennial herb belonging to the family Asteraceae, is widely distributed throughout Korea. In traditional oriental medicine, the dried root of *R. uniflorum* is referred to as "Nuro(漏蘆)" and has been used therapeutically to eliminate febrile toxins, reduce swelling, promote the discharge of pus, and stimulate lactation. The antioxidant effects of *R. uniflorum* were evaluated following extraction by high-pressure hot water (HW) and reflux water (RW) methods. In the measurement of DPPH radical scavenging ability, HW and RW showed the highest abilities of 94.53% and 95.2% at the concentration of 2.0 mg/mL, The ABTS radical scavenging effect of HW was 99.35% in the 2.0mg/mL, and the RW was 99.56%, respectively. Even at 1.0 mg/mL, HW and RW exhibited 92.74% and 93.69% scavenging activity. The superoxide dismutase (SOD)-like activity at 2.0 mg/mL was 84.55% for HW and 72.07% for RW. The tyrosinase inhibition of HW and RW were 39.15% and 51.27% at the concentration 2.0 mg/mL. These result showed that the *R. uniflorum* root "Nuro" has a significant anti-oxidative activity and effective ingredients useful for functional food and the cosmetic industry.

P5-47

Antioxidant potential of water and ethanol reflux extracts from *Acer tegmentosum* Maxim. Branches

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In this study, branches of *Acer tegmentosum* Maxim. were extracted by reflux extraction using water (ARW) and 70% ethanol (ARE), and their phytochemical contents and biological activities were compared to evaluate their potential as natural functional materials. The total polyphenol content was higher in ARW (163.79 mg TAE/g) than in ARE (148.96 mg TAE/g). At a concentration of 2,000 μg/mL, ARW exhibited the highest SOD-like activity (87.94%) and showed slightly higher DPPH radical scavenging activity (92.93%) than ARE. Both extracts demonstrated potent ABTS radical scavenging activities exceeding 99%. In addition, ARW exhibited potent tyrosinase inhibitory activity (92.98%), which was approximately 1.7-fold higher than that of ARE (56.50%). These findings indicate that both water and ethanol reflux extracts of A. tegmentosum branches possess strong antioxidant properties. Notably, ARW demonstrated superior total polyphenol content, antioxidant activity, and tyrosinase inhibitory activity compared with ARE. Therefore, the water reflux extract of *A. tegmentosum* branches may have considerable potential as a natural functional ingredient for antioxidant functional foods and skin-whitening cosmetic products.

P5-48

Physiological activities of high-pressure hot water extract of *Patriniae radix*

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In traditional oriental medicine, "*Patriniae radix* (Paejang, 敗醬) refers to the dried root of Patrinia scabiosaefolia, a perennial herb belonging to the family Valerianaceae, which is distributed across East Asia including Korea. *Patriniae radix* has been widely recognized for its therapeutic efficacy in alleviating inflammation, promoting the discharge of pus, and resolving blood stasis, and has therefore been traditionally applied in the treatment of furuncles, dermatitis, and gynecological disorders. The roots of *P. scabiosaefolia* (Paejang) were extracted using high-temperature and high-pressure hot water, and its bioactive properties were evaluated. The polyphenol compounds of PSHW was 57.47±0.75 mg/g. At a concentration of 2.0 mg/mL, the SOD-like activity and DPPH radical scavenging rate were 73.75 ± 0.75% and 89.01 ± 1.11%, respectively. The ABTS radical scavenging activity was 99.73 ± 0.09% at 0.5 mg/mL, showing no significant difference with increasing concentration. Tyrosinase inhibitory activity was 33.61±1.33%, while at 0.25 mg/mL it still exhibited an inhibitory effect of 29.21±1.12%. The above results suggest that the high-pressure hot water extract of *Patriniae radix* are strong free radical scavenging effects, indicating its potential as a functional bioactive material.

P5-49

Anti-inflammatory effects of *Artemisia fukudo* extract via regulation of MAPK and NF-κB signaling pathways

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Artemisia fukudo is a halophytic plant that grows in coastal dunes and salt marshes and contains various bioactive compounds with potential health-promoting properties. This study evaluated the anti-inflammatory effects of *A. fukudo* extract and investigated its underlying mechanisms in lipopolysaccharide (LPS)-stimulated RAW 264.7 macrophages. The major constituents of the extract were analyzed by high-performance liquid chromatography (HPLC), and its biological effects were assessed using cell viability, nitric oxide (NO) production, western blot, and real-time PCR analyses. HPLC analysis identified chlorogenic acid and dicaffeoylquinic acid derivatives, including 3,4-dicaffeoylquinic acid, 3,5-dicaffeoylquinic acid, and 4,5-dicaffeoylquinic acid, as major compounds in the extract. *A. fukudo* extract showed no significant cytotoxicity up to 200 μg/mL and dose-dependently inhibited LPS-induced NO production. In addition, the extract suppressed the phosphorylation of p38, ERK, JNK, p65, and IκBα, indicating regulation of the MAPK and NF-κB signaling pathways. Real-time PCR analysis further showed that the extract reduced the expression of inflammation-related genes, including inducible nitric oxide synthase (iNOS) and interleukin-6 (IL-6). These findings suggest that *A. fukudo* extract exerts anti-inflammatory effects by inhibiting inflammatory mediator production and modulating MAPK and NF-κB signaling pathways. Therefore, *A. fukudo* extract may be a promising natural anti-inflammatory material for functional food ingredient development.

P5-50

Evaluation of the anti-melanogenic potential of *Cnidium japonicum* extract as a natural functional ingredient

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Cnidium japonicum is a halophytic plant that grows in coastal dunes and salt marshes and has recently attracted attention as a potential source of natural functional ingredients due to its diverse bioactive compounds. In this study, we evaluated the anti-melanogenic activity of *C. japonicum* extract and investigated its possible regulatory mechanism in melan-a and B16F10 melanoma cells. The major constituents of the extract were analyzed by high-performance liquid chromatography (HPLC), and its biological effects were assessed using cell viability, melanin content, and western blot analyses. HPLC analysis identified isopimpinellin and osthole as the major compounds present in the extract. *C. japonicum* extract showed no significant cytotoxicity up to 250 μg/mL in both melan-a and B16F10 cells, indicating that the tested concentrations were suitable for evaluating anti-melanogenic activity. In B16F10 cells, treatment with the extract significantly and dose-dependently reduced cellular melanin content. Furthermore, western blot analysis demonstrated that *C. japonicum* extract downregulated the expression of tyrosinase-related protein-1 and tyrosinase-related protein-2 (TRP-1 and TRP-2), which are key melanogenesis-associated proteins. These findings suggest that *C. japonicum* extract inhibits melanogenesis by reducing melanin accumulation and suppressing TRP-1 and TRP-2 expression. Therefore, *C. japonicum* may be a promising natural material for skin-whitening applications and functional food or cosmetic ingredient development.

P5-51

Microalgae-derived fucoxanthin attenuates Alzheimer's disease-like pathologies by regulating Aβ/Tau aggregation and NLRP3 inflammasome activation

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive impairment, amyloid-β (Aβ) accumulation, tau abnormalities, and chronic neuroinflammation. This study evaluated the therapeutic potential of fucoxanthin, a marine carotenoid extracted from the microalga Phaeodactylum tricornutum, against AD-related pathological changes. The effects of fucoxanthin on Aβ and tau aggregation were assessed using thioflavin fluorescence assays, PICUP assay, dot blot analysis, and in silico molecular docking. In addition, APP/PS1 transgenic mice were administered fucoxanthin, and cognitive function, amyloid pathology, tau abnormalities, glial activation, and NLRP3 inflammasome signaling were examined using behavioral tests, histological analysis, ELISA, immunoblotting, and co-immunoprecipitation. Fucoxanthin inhibited the aggregation of Aβ and tau and promoted the dissociation of their pre-formed aggregates. Molecular docking analysis suggested that fucoxanthin interacts with hydrophobic regions of Aβ and tau aggregates. In APP/PS1 mice, fucoxanthin administration improved learning and memory deficits and reduced Aβ plaque burden, oligomeric Aβ, hyperphosphorylated tau, and oligomeric tau in the brain. Moreover, fucoxanthin suppressed astrocyte and microglial activation and reduced Aβ-induced NLRP3 inflammasome activation, as evidenced by decreased IL-1β release, cleaved caspase-1 levels, and ASC-NLRP3 association. These findings suggest that microalgae-derived fucoxanthin may be a promising multi-target candidate for alleviating AD-related protein aggregation and neuroinflammation.

P5-52

Protective effects of ginsenoside Rg5-enriched red ginseng extract against oxidative stress in C2C12 myotubes

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Red ginseng is known as a representative functional material containing various ginsenosides, and the content of minor ginsenosides varies depending on processing conditions. In this study, red ginseng extract with enhanced ginsenoside Rg5 (Rg5) content was prepared using Jinan red ginseng, and its functionality was evaluated by comparing them with two commercially available red ginseng products and a standard red ginseng water extract. The ginsenoside composition of each sample was analyzed using HPLC, and the Rg5 content in the Rg5–enhanced red ginseng extract was significantly higher than that of the other samples. None of the samples showed significant toxicity in C2C12 cells. Under oxidative stress induced by H_2O_2, the Rg5–enhanced red ginseng extract significantly restored reduced cell viability and demonstrated superior cytoprotective effects compared to the control samples. Furthermore, measurements of intracellular ROS production confirmed that the extract effectively inhibited ROS production, which was increased by H_2O_2 treatment. Based on the above results, Jinan red ginseng extract with enhanced Rg5 content exhibited excellent antioxidant activity and cytoprotective effects, and was considered to have high potential for use as a functional food ingredient.

P5-53

Antioxidant activities and cytoprotective effects of red ginseng and *Petasites japonicus* mixed extracts

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This study was conducted to evaluate the value of a mixed extracts of red ginseng (*Panax ginseng* C.A. Mayer) and Petasites japonicus as a novel material for improving memory by investigating its antioxidant activity, cytotoxicity, neuronal apoptosis protection and reactive oxygen species (ROS) scavenging ability. Analysis results confirmed that the mixed extracts categorized by ratio of red ginseng and *P. japonicus* exhibited DPPH and ABTS radical scavenging abilities similar to those of the positive control and the total polyphenol and total flavonoid content within the extracts were determined. In the cytotoxicity evaluation, no significant cytotoxicity was observed up to 100 μg/mL. Additionally, when the mixed extracts of red ginseng and *P. japonicus* was applied to a cell model induced by oxidative stress, it demonstrated a significant apoptosis protection effect compared to the control group and effectively inhibited intracellular ROS production. The results of this study confirm that the mixed extracts of red ginseng and *P. japonicus* is a safe natural material possessing excellent antioxidant activity and cytoprotective efficacy and suggest the potential for developing functional health materials based on antioxidant and neuronal protection capabilities in the future.

P5-54

Evaluation of the potential of red ginseng by-products for anti-inflammatory activity and functional applications

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It is a substance that is in focus because of the growing demand for environmentally friendly upcycling techniques that use by-products from the production of red ginseng. In order to examine the ginsenosides that make up red ginseng gourd and validate its potential as a functional material, an anti-inflammatory experiment was carried out in this study. White ginseng, red ginseng, and black ginseng were extracted by concentration in the same manner in order to evaluate and examine the composition as well as effectiveness of red ginseng residue. Red ginseng residue exhibited the lowest total ginsenoside concentration in the ginsenoside analysis using HPLC. In the case of antioxidant activity, black ginseng was the highest, and it can be seen that the inhibitory activity is increased by concentration. While possessing a low ginsenoside content, red ginseng gourd has been confirmed to demonstrate the best anti-inflammatory effects and the greatest cell viability rate when compared to other extracts of the same dose. For the use and study of red ginseng residue, these findings can be used as a more efficient basic research approach. Furthermore, the red ginseng gourd is thought to provide a variety of useful characteristics due to its physiological activity impacts.

P5-55

Antioxidant activities of protein hydrolysates from *Gryllus bimaculatus* and *Locusta migratoria* prepared by ultrasound-assisted enzymatic hydrolysis

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Edible insects are promising alternative protein sources with nutritional value and potential bioactivities. Enzymatic hydrolysis can release bioactive peptides from insect proteins, and ultrasound treatment may improve hydrolysis efficiency. This study evaluated the antioxidant activities of protein hydrolysates from defatted *Gryllus bimaculatus* (GB) and *Locusta migratoria* (LM) prepared using ultrasound–assisted enzymatic hydrolysis. DPPH and ABTS radical scavenging activities were measured, and Folin–Ciocalteu–reactive reducing compounds were analyzed as a supplementary indicator of reducing capacity. The cytoprotective effects of selected hydrolysates against H_2O_2–induced oxidative stress was evaluated in Vero cells. Ultrasound–assisted enzymatic hydrolysis enhanced radical scavenging activities, with different optimal conditions depending on insect species. LM hydrolysates showed high DPPH and ABTS activities after combined treatment. Selected hydrolysates improved viability in H_2O_2–treated Vero cells, suggesting protection against oxidative stress. These results suggest that combined ultrasound and enzymatic treatment improves antioxidant activities of edible insect proteins and that GB and LM hydrolysates may be useful as functional food ingredients.

P5-56

Immune-enhancing potential of heat-killed acetic acid bacteria in RAW 264.7 macrophages

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Heat-killed bacteria have recently attracted attention as postbiotic materials due to their stability and safety; however, most studies have focused on lactic acid bacteria, while the functionality of heat-killed acetic acid bacteria remains limited. This study evaluated the immune-enhancing potential of heat-killed acetic acid bacteria isolated from vinegar in RAW 264.7 macrophages. Five acetic acid bacterial strains were prepared as heat-killed cells, and Lacticaseibacillus rhamnosus GG was used as a comparative strain. Cell viability, nitric oxide (NO) production, cytokine production, and immune-related gene expression were analyzed using MTT assay, Griess assay, ELISA, and RT-qPCR, respectively. None of the tested strains showed cytotoxicity. Heat-killed acetic acid bacteria increased NO, TNF-α, and IL-6 production compared with the control group. RT-qPCR analysis also showed increased mRNA expression of TNF-α and IL-6. These results suggest that heat-killed acetic acid bacteria isolated from vinegar can activate RAW 264.7 macrophages by enhancing NO production, pro-inflammatory cytokine production, and immune-related gene expression, indicating their potential as immune-enhancing postbiotic materials.

P5-57

Antibacterial activity and major bioactive compounds of Longan (*Dimocarpus longan*) seed extract

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Longan (*Dimocarpus longan*) is widely consumed in Asian countries, generating substantial amounts of seed by-products during processing. Longan seeds account for approximately 17% of the fruit weight but are largely discarded despite their potential as a source of bioactive compounds. The present study was conducted to evaluate the antibacterial activity of longan seed extracts and identify major bioactive compounds. Among the six extracts, ethanol extract (EOHrt) exhibited the strongest antibacterial activity against *Staphylococcus aureus*, *S. epidermidis*, and *Cutibacterium acnes*. The EOHrt extract was subsequently fractionated using hexane (HxP), ethyl acetate (EAP), 1-butanol (BuP), and distilled water (DP). Among the fractions, EAP exhibited the highest total phenolic and flavonoid contents and showed the strongest antibacterial activity. Among the tested bacteria, *C. acnes* exhibited the highest susceptibility to EAP. GC-MS analysis revealed that ellagic acid, gallic acid, and ethyl gallate were the major constituents of the EAP. These results suggest that longan seed by-products may serve as a valuable source of natural antibacterial agents and support their value-added utilization.

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P5-58

Antioxidant activities of granola bars supplemented with black sesame, hibiscus, and sweet pumpkin powders

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This study aimed to evaluate the antioxidant activity of granola bars supplemented with functional ingredients. Granola bars were prepared by adding black sesame powder, hibiscus powder, or sweet pumpkin powder, and their antioxidant activities were compared with those of a control granola bar without functional ingredients. Total polyphenol content (TPC), total flavonoid content (TFC), DPPH radical scavenging activity, ABTS radical scavenging activity, Fe-chelating activity, and ferric reducing antioxidant power (FRAP) were measured. Among the samples, the hibiscus-added granola bar showed the highest TPC and TFC. DPPH radical scavenging activity was high in all samples, exceeding 95%, and ABTS radical scavenging activity was also high, exceeding 83% in all samples. In particular, the sweet pumpkin-added granola bar showed the highest ABTS radical scavenging activity (90.10%). Fe-chelating activity was lowest in the hibiscus-added granola bar (57.44%), whereas the black sesame-added granola bar showed the highest activity (82.70%). FRAP was highest in the hibiscus-added granola bar. Overall, granola bars supplemented with functional ingredients showed superior antioxidant-related properties compared with the control. In particular, the hibiscus-added granola bar exhibited high TPC, TFC, and FRAP, suggesting its potential as an effective ingredient for enhancing antioxidant functionality. These results indicate that the selection of appropriate functional ingredients is an important factor in improving the quality and functionality of granola bars.

P5-59

Antioxidant properties of hibiscus-based jelly supplemented with red beet and blueberry

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This study aimed to evaluate the antioxidant activity of jelly containing hibiscus, red beet, and blueberry for the development of functional jelly products. Four types of jelly were prepared: jelly with hibiscus (HJ), jelly with hibiscus and red beet (HRJ), jelly with hibiscus and blueberry (HBJ), and jelly with hibiscus, red beet, and blueberry (HRBJ). Total polyphenol content (TPC), total flavonoid content (TFC), DPPH radical scavenging activity, ABTS radical scavenging activity, Fe-chelating activity, and ferric reducing antioxidant power (FRAP) were measured. TPC was highest in HRJ (235.98 μg GAE/mL), followed by HBJ (225.60 μg GAE/mL), HJ (224.41 μg GAE/mL), and HRBJ (220.54 μg GAE/mL). In contrast, TFC was highest in HRBJ (65.56 μg QE/mL) and lowest in HJ (35.56 μg QE/mL). DPPH and ABTS radical scavenging activity were showed the highest in HRJ. In addition, HRJ, HBJ, and HRBJ exhibited higher Fe-chelating activity than HJ, and HRJ showed the highest Fe-chelating activity at 51.40%. FRAP analysis revealed that HRJ, HBJ, and HRBJ exhibited higher reducing power than HJ, with HBJ showing the greatest FRAP value among all samples. Overall, the addition of red beet or blueberry to hibiscus jelly improved antioxidant activity compared with hibiscus-only jelly. In particular, HRJ showed high TPC, DPPH radical scavenging activity, ABTS radical scavenging activity, and Fe-chelating activity, suggesting its potential as a functional jelly material. Therefore, the combined addition of hibiscus and red beet may be an effective formulation for developing jelly with enhanced antioxidant functionality.

P5-60

Anti-inflammatory effects of *Ainsliaea acerifolia* ethanol extract in LPS-induced RAW 264.7 cell

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This study evaluated the anti-inflammatory properties of a 70% ethanol extract from *Ainsliaea acerifolia*. Cell viability was assessed via MTT assay, while the production of nitric oxide (NO), interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α), and prostaglandin E2 (PGE2) was measured using Griess and enzyme-linked immunosorbent assays (ELISA). In lipopolysaccharide (LPS)-induced RAW 264.7 cells, A. acerifolia significantly decreased NO, IL-6, TNF-α, and PGE2 levels in a dose-dependent manner. Furthermore, the extract suppressed the expression of iNOS and COX-2 at both protein and mRNA levels. Among the 10 components isolated from the ethyl acetate layer, Ainsliaside A demonstrated the most potent inhibitory effect on NO production. These findings suggest that 70% ethanol extracts of Ainsliaea acerifolia possess significant anti-inflammatory potential and could serve as a valuable source for functional foods aimed at preventing inflammatory diseases.

P5-61

Photoprotective effects of a 30% ethanol extract of *Abalone viscera* against UVB-induced oxidative stress and apoptosis in human dermal papilla cells

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This study evaluated the photoprotective effects of a 30% ethanol extract of *Abalone viscera* (AVE) in UVB-exposed human dermal papilla (HDP) cells, which play a key role in hair growth and follicle regeneration. AVE significantly increased cell viability by reducing intracellular reactive oxygen species (ROS) production without exhibiting cytotoxicity in UVB-exposed HDP cells. In addition, AVE inhibited apoptosis by decreasing apoptotic body formation, the increase in the sub-G1 population, and mitochondrial membrane potential dysfunction induced by UVB exposure. Furthermore, AVE regulated the mitochondria-mediated apoptotic pathway, suppressed the activation of MAPK and NF-κB signaling pathways, and enhanced the Nrf2/HO-1 antioxidant signaling pathway as well as β-catenin expression. Collectively, these findings indicate that AVE exerts protective effects against oxidative stress and apoptosis induced by UVB exposure in human hair follicle dermal papilla cells and suggest that AVE may serve as a potential natural agent for preventing hair loss and promoting hair growth.

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P5-62

Anti-melanogenic effects of strawberry (*Fragaria × ananassa*) stem by-products via downregulation of MITF-mediated signaling pathways

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This study investigated the whitening effects of discarded strawberry (*Fragaria × ananassa*) stem extracts prepared with distilled water (FSD) and 70% ethanol (FSE) and elucidated their anti-melanogenic mechanism. Whitening activity was assessed via tyrosinase inhibition assays and melanin production analysis in α-MSH-stimulated B16F10 melanoma cells. FSE showed strong tyrosinase inhibition (46.98% at 1,000 μg/mL), and both extracts significantly suppressed melanin production without cytotoxicity below 100 μg/mL. Western blotting and RT-PCR analyses revealed that the extracts markedly downregulated MITF and its downstream targets (tyrosinase, TRP-1, and TRP-2) at both protein and mRNA levels. These findings demonstrate that *F. × ananassa* stem extracts inhibit melanogenesis via MITF suppression and highlight the potential of agricultural by-products as sustainable, high-value ingredients.

P5-63

Potential of *Momordica cochinchinensis* peel extract as a functional material for preventing inflammatory skin disorders

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Chronic skin inflammation and oxidative stress drive various skin disorders, highlighting the need for safe, functional ingredients. *Momordica cochinchinensis* is a plant traditionally used in food and herbal medicine; however, the biological activities of its peel have not been fully investigated. This study aimed to evaluate the antioxidant and anti-inflammatory properties of *M. cochinchinensis* peel extracts and to assess their potential applicability as functional materials. Hot water (MCW) and 70% ethanol (MCE) extracts were prepared, and their efficacy was assessed using antioxidant and anti-inflammatory assays. Both extracts exhibited high polyphenol content and strong antioxidant activity, with MCE showing slightly higher efficacy than MCW. At non-cytotoxic concentrations, the extracts significantly suppressed LPS-induced NO production. Furthermore, the expression levels of key inflammatory mediators, inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2), were markedly reduced at both the protein and mRNA levels. These results demonstrate that *M. cochinchinensis* peel extracts possess notable antioxidant and anti-inflammatory activities. The findings provide scientific evidence supporting the use of this underutilized plant by-product as a functional ingredient and contribute to the growing body of research on natural materials for food industry targeting inflammation-related disorders.

P5-64

Protective effects of *Chamaecrista nomame* (Siebold) H. Ohashi extract against obesity-induced inflammation and insulin resistance

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Obesity is associated with chronic low-grade inflammation and insulin resistance, with TNF-α playing a central role in adipose tissue dysfunction. This study investigated the anti-inflammatory, anti-obesity, and insulin-sensitizing effects of *Chamaecrista nomame* (Siebold) H. Ohashi (*C. nomame*) through phytochemical characterization, *in chemico* assays, and *in vitro* models. Among the extracts tested, the 40% ethanol extract (ECNE) showed higher phytochemical contents and stronger nitrite scavenging, pancreatic lipase inhibitory, and α-glucosidase inhibitory activities than the hot-water extract. ECNE and its marker compound luteolin suppressed inflammatory mediator production through inhibition of NF-κB and MAPK signaling, reduced adipogenesis by downregulating adipogenic factors, and enhanced insulin-stimulated glucose uptake and Akt phosphorylation. In a TNF-α-induced adipocyte dysfunction model, both attenuated inflammatory responses and restored insulin responsiveness. Collectively, these findings demonstrate that ECNE exerts anti-inflammatory, anti-obesity, and insulin-sensitizing effects and may serve as a promising natural resource for obesity-related metabolic disorders.

P5-65

Analysis of gastrointestinal kinetics: How processing methods alter the *in vitro* digestive characteristics of shrimp (*Litopenaeus vannamei*)

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Food processing is a critical factor influencing protein digestibility and nutritional value. With fresh shrimp (F) as the control, the combined effects of three typical processing methods: raw-frozen (RF), cooked-frozen (FC), and dried (D), on the muscle quality and digestive characteristics of shrimp (*Litopenaeus vannamei*) were systematically investigated. The results indicated that processing methods modulated the final digestibility of shrimp; among the three typical processing methods for shrimp, raw-frozen (RF) treatment best preserved shrimp muscle quality and digestibility, whereas drying (D) altered the muscle quality and impaired protein digestion. Digestive kinetics results indicated that RF treatment maintains higher rates and degrees of digestion. Principal component analysis (PCA) and correlation analyses identified microstructure, texture, moisture state, and myofibrillar protein structure/oxidation as key factors governing digestibility differences among processing methods. This study provides a theoretical basis for the targeted regulation of shrimp processing technologies to optimize nutritional quality.

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P5-66

Effects of different acetic acid bacteria on organic acid composition and functional quality of dried persimmon vinegar

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Dried persimmon is a valuable agricultural resource for producing functional vinegar; however, the effects of different acetic acid bacteria on the chemical composition and functional quality of dried persimmon vinegar have not been fully investigated. This study evaluated the influence of five acetic acid bacterial sources (Mother vinegar, an isolated strain, *Acetobacter aceti* KCTC 12290, *Acetobacter pasteurianus* KCTC 1008, and *Gluconobacter oxydans* KCTC 2111) on organic acid composition, antioxidant activity, and bioactive compounds during vinegar fermentation at 30℃, the optimum fermentation temperature determined in our previous study. Mother vinegar produced the highest acetic acid concentration (6,920.20 mg/100 mL), whereas the isolated strain showed the highest concentrations of citric, tartaric, and lactic acids, indicating distinct metabolic characteristics among the bacterial strains. Total polyphenol content increased by approximately 30% during fermentation and reached the highest level in the isolated strain (130.00 mg GAE/100 mL). ABTS radical scavenging activity remained stable or slightly increased during fermentation, whereas DPPH activity showed only minor strain-dependent changes. Flavonoid and tannin contents also varied according to the bacterial strain. These results demonstrate that the choice of acetic acid bacteria significantly influences the organic acid composition and functional quality of dried persimmon vinegar. Mother vinegar exhibited superior acetic acid production, whereas the isolated strain showed greater potential for enhancing functional bioactive compounds. These findings provide valuable information for selecting appropriate starter cultures according to the desired quality characteristics of functional dried persimmon vinegar.