Poster Session

PART I Food Preservation, Packaging, and Distribution

P1-01

Influence of cold storage combined with a plasma system on the quality attributes of postharvest hardy kiwifruit

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Hardy kiwifruit (Actinidia arguta) is smaller than the common fuzzy kiwifruit and is characterized by its smooth, edible skin. However, its climacteric nature poses a significant challenge in maintaining fruit marketability during postharvest preservation and distribution. Cold plasma technology has recently gained attention as an effective method for preserving fruit quality. In this study, we investigated the effects of cold plasma treatment (a storage room [dimensions: 3 × 4 × 3 m] containing approximately 60 ppb of ozone [O_3], along with negative ions and free radicals generated by a cold plasma device [Model: HKF-10; Biozone Scientific, BiozoneKorea, Anyang, South Korea])—no treatment (Control), initial plasma treatment for 24 hours (IP), and continuous plasma treatment (CP)—on the postharvest quality of two hardy kiwifruit cultivars, 'Cheongsan' and 'Daebo', during low-temperature storage (5°C, 85-90% RH). The results showed that CP significantly reduced fruit weight loss and delayed the loss of fruit firmness in both cultivars throughout the 12-week storage period. Additionally, the incidence of physiological disorders such as shriveling, browning, and decay was notably lower in the CP-treated fruit of both cultivars over the 12-week period. Our findings clearly demonstrate that continuous cold plasma treatment is an effective approach for maintaining the postharvest quality of hardy kiwifruit by delaying ripening and reducing storage-related physiological disorders under low-temperature conditions. This work was supported by the National Institute of Forest Science [Project No. FP0802-2022-02]

P1-02

Effects of precooling and packaging methods on the quality attributes of *Kalopanax septemlobus* sprouts during simulated distribution

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Kalopanax septemlobus sprouts are nutrient-rich, edible wild herbs whose production has steadily increased in South Korea. However, their commercial potential is limited by a short shelf life, primarily due to quality deterioration such as wilting and yellowing. This study evaluated the effects of precooling conditions (no treatment, 5°C for 24 hours [P5], and 10°C for 24 hours [P10]) and packaging methods (standard packaging [Control] and packaging with moisture paper [MP]) on the quality attributes of K. septemlobus sprouts during a simulated 2-day distribution period. Leaf wilting occurred across all treatments, regardless of precooling temperature, except in the MP-packaged groups, where wilting was absent for up to two days. Although stipule loss was observed in all treatments, it was notably reduced in the MP packaging. The lowest respiration rate was recorded in the P5-MP treatment. Interestingly, the highest levels of total phenolic content and antioxidant activity were detected in the P5-Control group, coinciding with an increased concentration of kalosaponin B. These findings suggest that low-temperature precooling may induce mild cold stress in K. septemlobus sprouts, even in the absence of visible symptoms such as leaf blackening. Moreover, MP packaging appears to alleviate this stress during distribution. Overall, the combination of 5°C precooling and MP packaging helps maintain the postharvest quality and freshness of K. septemlobus sprouts during distribution. This work was supported by the National Institute of Forest Science [Project No. FP0802-2022-02]

P1-03

Enhancement of CO_2 barrier properties in PET bottles for carbonated beverages using SiOx plasma coating technology

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This study investigated silicon oxide (SiOx) plasma coating technology to enhance CO_2 barrier properties in PET bottles for carbonated beverages. SiOx coatings (50-150 nm) were deposited on bottle interiors using Plasma Impulse Chemical Vapor Deposition (PICVD), and CO_2 permeability was evaluated according to ASTM F1115 standards. through three complementary studies examining coating thickness effects, beverage storage trials, and economic feasibility. A 100 nm SiOx coating achieved an 85% reduction in CO_2 permeability (0.0008 cc/pkg/day vs. 0.0053 cc/pkg/day for uncoated bottles) and extended carbonated beverage shelf life from 10 to 44 weeks while maintaining product quality parameters including CO_2 retention and sensory attributes. The nanoscale coating maintained structural integrity and recyclability while providing significant improvements in product quality retention, demonstrating strong potential for industrial application in the food packaging industry with minimal impact on processing parameters.

P1-04

Effects of washable cellulose microfiber-based coating on the physicochemical quality of cherry tomato during cold storage

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Cherry tomatoes are prone to rapid quality decline during storage owing to their climacteric ripening process. This study focused on a washable coating using cellulose microfibers (CMFs) extracted from kimchi cabbage byproducts (KCBs) to maintain their postharvest quality. The powdered CMFs were obtained through a citric acid/hydrogen peroxide pretreatment followed by mechanical defibrillation using a high-speed blender, resulting in enhanced aspect ratio, whiteness index, crystallinity, and thermal stability compared to those of the original KCB. Increasing the CMF content in coating solution improved the UV-blocking, water vapor barrier properties, and tensile strength of the CMF-based films. Before storage at 4 °C, the coating layers on cherry tomatoes were formed by spraying a coating solution containing 0.7 wt% powdered CMF. Compared to uncoated cherry tomatoes (control), those coated with CMF retained their weight, firmness, and total phenolic content more effectively during storage. After 3 min of hand washing, the CMFs coated on the surface of the cherry tomatoes were completely removed. These findings suggest that CMFs derived from KCB are an eco-friendly biopolymer for spray coatings to maintain the quality of perishable small fruits.

P1-05

Effect of small packaging treatment on the quality of Gondalbi (*Ligularia stenocephala* (Maxim.) Matsum. & Koidz.)

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Ligularia stenocephala (known as gondalbi) is a perennial plant of the Asteraceae family, primarily consumed for its young leaves as a wild vegetable. The functional properties of gondalbi, such as antioxidant, anti-obesity, and anti-diabetic effects, have been identified, enhancing its value as a health food. Recently, there has been a growing consumer demand for gondalbi in recent years. This study investigated post-harvest quality changes in gondalbi under different small packaging methods to improve its packaging and distribution system. Harvested gondalbi samples (100 g) were sealed in polyethylene(PE) film bags (25 × 30 cm) with three types of perforation treatments: non-perforated, micro-perforated, and eight-hole (Ø 0.8 mm) perforated, and used as analysis samples. The samples were stored at 4 ± 1℃ and 70 ± 5% relative humidity for 30 days. During storage, weight loss, respiration rate (CO2 emission), color change, chlorophyll content (SPAD value), and the degree of freshness were evaluated. The non-perforated packaging showed the lowest weight loss and respiration rate, as well as the most stable SPAD values, maintaining freshness for the longest duration. In all treatments, the respiration rate was found to increase until day 14 and then decreased thereafter. After day 15, yellowing and browning were observed in the micro and eight-hole perforated treatments, while softening symptoms began to appear in the non-perforated treatment. Therefore, the effective shelf life of gondalbi under all tested PE film small packaging methods is considered to be limited to 15 days during storage at 4°C, and a freshness-retaining consumption period of up to 15 days is recommended for micro-perforated and eight-hole perforated PE films, and up to 20 days for non-perforated PE film.

P1-06

Validation of phthalates analysis method in rubber utensils and containers

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Phthalates, widely used as plasticizers, are considered potential endocrine-disrupting chemicals with reproductive toxicity, leading to increasing regulatory concern regarding their migration from food contact materials. This study developed and validated an analytical method for the simultaneous determination of eleven phthalates in rubber-based food utensils and containers intended for infants and children in Korea. The target compounds included DBP, BBP, DEHP, DNOP, DIDP, DINP, DEHA, DIBP, DPP, DHP, and DCHP. Migration tests were conducted using three food simulants (water, 4% acetic acid, and 20% ethanol) at 70°C for 30 min. Samples were extracted via liquid-liquid extraction using acetone:hexane (1:1, v/v), followed by concentration and reconstitution in acetone. Quantification was performed by gas chromatography-mass spectrometry (GC-MS) using a DB-5MS column (30 m × 0.25 mm, 0.25 μm). Method validation was conducted according to European Commission JRC guidelines. Linearity was achieved over the range of 0.05-4 mg/L with $R^2 \geq 0.99$. Limits of quantification ranged from 0.017 to 0.060 mg/L. Recoveries ranged from 81.05% to 110.04%, with relative standard deviations between 0.05% and 8.81%. These results demonstrate the method's reliability and suitability for monitoring phthalate migration in rubber-based food contact materials. This research was supported by (24191MFDS046) from Korea Ministry of Food and Drug Safety in 2025.

P1-07

Influence of storage conditions on the quality of wheat (*Triticum aestivum* L.)

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Postharvest quality management is crucial for the utilization of domestic wheat as a food processing material. The harvest period overlaps with rice transplanting and the rainy season, resulting in rapid procurement. Consequently, most wheat is dried by individual farmers and stored in general warehouses until it is distributed for use. The objective of this study was to evaluate quality changes in wheat during storage. The 'Saekeumkang' wheat cultivar was stored for 12 months under three temperature conditions (room temperature, 15°C, 4°C). The acid value gradually increased during storage, reaching 24.1 mg KOH/100 g after one year at room temperature. In contrast, significantly lower values were observed under cooler conditions (17.0 at 15°C and 15.6 at 4°C). the germination rate decreased from 93.3% to 85.0% at room temperature. However, higher rates were maintained under low-temperature conditions (86.7% at 15°C, 90.7% at 4°C). Based on these results, low-temperature storage is recommended for domestic wheat. For food processing purposes, cool storage (below 15°C) is advisable, while cold storage(4°C) is recommended when the wheat is intended for use as seed.

P1-08

The impact of HS code-related food non-compliance: A regulatory analysis using the CES food database

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The TBT Agreement disciplines the formulation of technical food regulation conformity procedures, complementing the SPS framework in determining how technical measures impact international food trade. Failures to meet food sanitary requirements often stem from obstacles such as inaccurate information on safety standards and customs procedures, directly disrupting smooth circulation and delaying market distribution. Additionally, food distribution conditions based on local country requirements along with restrictions on the distribution of imported food, exacerbate logistical inefficiencies and undermine equitable market access. As a practical response, this study examines how the CES (Correct, Easy, Speedy) Food Database provides non-discriminatory, publicly accessible, and clearly codified HS Code-based information. The discussion explains how the CES Databse provides structured, country-specific data on food safety standards and customs procedures, thereby enhancing food export planning and regulatory risk management while preventing technical regulations from becoming disguised barriers to trade.

P1-09

Quality changes in 'Niitaka' pears according to size grading during cold storage

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This study investigated the quality changes of 'Niitaka' pears classified by weight grade during cold storage at an Agricultural Products Processing Center (APC). Pears were sorted using a weight grader into three categories: Large (521.7 ± 25.6 g), Medium (453.6 ± 18.8 g), and Small (395.2 ± 15.7 g). The graded fruits were packed in 20 kg boxes with individual polyethylene wrapping, stacked on pallets, and stored at 0-1°C with 90-99% relative humidity for five months in Naju, Korea. Monthly evaluations were conducted to assess weight loss, flesh firmness, soluble solids content (SSC), titratable acidity (TA), and peel color (CIE L, a, b values and hue angle). At the time of grading, Small fruits showed higher firmness and lower SSC compared to Medium and Large fruits. During storage, all size grades exhibited decreasing trends in firmness and SSC, while weight loss increased. In contrast, TA and peel color were not significantly affected by storage duration. Notably, Small fruits retained higher firmness throughout the storage period but maintained relatively lower SSC, suggesting the need for size-specific postharvest handling. These results highlight the importance of size grading in postharvest quality management and provide useful insights for optimizing storage and distribution strategies. This study was supported by the Rural Development Administration research project No. PJ01733801.

P1-10

계란 품종별 저장온도가 계란의 저장성에 미치는 영향

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본 연구는 계란 품종별 저장 온도가 품질에 미치는 영향을 규명하고자 수행하였다. 35 주령 하이라인 브라운, 이사 브라운, 로만 브라운 계란을 10 ℃와 15 ℃에서 9 주간 저장하며 품질 지표를 측정하였다. 저장 9 주차 HU(Haugh unit)는 15 ℃ 조건에서 하이라인 브라운 81.58, 이사 브라운 53.79로 나타나 10 ℃ 조건(각각 67.32, 41.76) 대비 유의적으로($p<0.05$) 높게 유지되었다. 반면 저장 종료 시점의 로만 브라운은 두 온도 간 HU에 유의적 차이가 없었다($p>0.05$). 따라서 10 ℃ 저온 저장은 전반적으로 HU 감소를 지연시켜 품질 유지에 유리한 경향을 보였으나, 저장 기간과 품종별 반응 차이가 존재하였다. 향후 연구에서는 사육 환경 등 외부 요인을 통제하여 온도별·품종별 저장 안정성에 대한 추가 연구가 필요하다.

P1-11

AI 기반 마른김 품질 등급 판별 솔루션

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티맥스티베로

국내외 마른김 품질 평가는 현재까지 관능검사와 파괴검사에 의존하고 있으며, 그로 인한 주관성, 제품 손상, 시간 소요 등의 한계가 존재한다. 본 연구에서는 그러한 문제를 해결하기 위해 마른김의 품질을 정량적으로 분석하고 등급을 자동 판별할 수 있는 AI 기반 마른김 품질 판별 솔루션을 개발하였다. 본 연구의 AI 솔루션은 분광, UV와 일반 카메라를 활용한 영상 데이터 및 NIR 수치 데이터를 수집하고, 이물질 탐지, 구멍끼 및 색도 분석, 수분·단백질 분석을 위한 AI 모델들을 포함하고 있다. 최종적으로, 마른김 품질 등급 판별을 위해 각 AI 모델의 출력값들을 이용하여 멀티모달 기반 실시간 등급 판정이 가능한 시스템을 구현하고 목포수산식품지원센터에 구축된 테스트베드를 통해 실증하였다. 이 연구는 2025년 과학기술정보통신부, 정보통신산업진흥원의 재원으로 부처협업기반 AI확산(AI 기반 마른김 품질 등급 판별 솔루션 개발 및 실증) 사업의 지원을 받아 수행된 연구이다.

P1-12

Identification of optimal export conditions for high-quality 'Winter Prince' exports

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'Winter Prince' is a mandarin orange variety developed by Rural Development Administration. Winter Prince is a highly promising export item. To maintain quality and extend the shelf life until export, it is necessary to determine the optimal export conditions such as CA treatment(CA, reefer) and distribution temperature (7°C, 20°C). When comparing weight loss rates immediately after two weeks of storage, there was no significant difference between the CA-treated group and the Reefer group. However, after two weeks of distribution, the weight loss rate of the Reefer group was higher than that of the CA-stored group. The ratio of sugar content to acidity was higher in the CA group immediately after storage. After 14 days of distribution, there were no differences in the ratio of sugar content to acidity between the treatment groups. The respiration rate differed between the CA-treated group and the control group immediately after CA storage. However, after distribution, the effect of temperature was greater than that of storage method. There were no significant differences in ascorbic acid content depending on storage method or distribution temperature. This study was supported by the Rural Development Administration research project(PJ01736002).

P1-13

Quality and traceability management in drying and storage center (DSC) for domestic wheat

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Domestic wheat (DW) is grown and harvested in production complexes (approximately 80 sites) and then transported to large-scale DSC for consistent processing, including import, drying, and storage. The DW quality and tradability management system was set up to manage the production history, import history, and processing history during the process from the cultivation and production stages, when the wheat is brought into a DSC after harvest, processed (dried and stored), and then exported (distributed). The tradability factors of the production farms are farms, farmland information, varieties, and cultivation, and the DSC are set as import, processing (drying and storage), and distribution. The main technologies required for history management from production to distribution are digital mapping, mobile, wireless recognition technology, non-destructive quality measurement technology, communication technology, PLC, sensing, signal processing, programming, and database construction, and the data of the history factors implemented with the relevant technologies are configured to be managed by a web-based history management program. In the future, we plan to develop a prototype of a quality and tradability management system and distribute it to DW DSC through various performance evaluations. This work was carried out with the support of "Research Program for Agriculture Science and Technology Development (Project No. RS-2025-02263107)" Rural Development Administration, Republic of Korea.

P1-14

Effect of ice pack placement and quantity in EPS boxes on the quality of kimchi during distribution

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This study evaluated the effects of ice pack placement and quantity in delivery boxes on kimchi during distribution. Kimchi was stored in expanded polystyrene (EPS) boxes at 25℃ for 72 h under 6 conditions: no ice pack (Control), 1 pack on the top (1S_top) or bottom (1S_bottom), 2 packs on the top and bottom (2S_top_bottom), 2 packs on both sides (2S_sides), and 4 packs on all sides (4S_all). Temperature, pH, acidity, gas composition (O2 and CO2), microbial communities, and metabolites were monitored. The 4S_all group best suppressed temperature rise, maintaining core temperature below 10℃ for over 24 h. Consequently, it showed the slowest changes in pH, acidity, and gas composition. Microbial communities rapidly diverged after 24 h depending on temperature, with Weissella koreensis dominating in poorly cooled groups, while initial populations remained more abundant under stable temperature conditions. Ice packs also delayed shifts in metabolite profiles, with mannitol, lactic acid, sorbitol, and sucrose (VIP scores 〉1.0) identified as major metabolites contributing to sample differentiation. These results show that appropriate ice pack placement and quantity are critical for controlling temperature-induced fermentation and maintaining kimchi quality during distribution.

P1-15

Comparative analysis of quality deterioration in center, tail, and fin portions of salmon (*Salmo salar*) fillets under different storage temperatures

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Salmon (Salmo salar) has become increasingly popular in Korea, with national per capita consumption rising from approximately 1.5 kg in 2019 to over 2.5 kg in 2023. Owing to its favorable nutritional profile and palatability, salmon is commonly marketed as fillets, with freshness being a critical determinant of consumer acceptance and preparation methods. This study investigated the quality changes in three anatomical portions of salmon fillets (center, tail, and fin) during storage at 5°C for up to 27 days and at 25°C for up to 6 days, or until spoilage was evident. Quality parameters, including volatile basic nitrogen (VBN), weight loss, pH, and salinity, were systematically monitored. At 5°C, both VBN and weight loss exhibited gradual increases across all portions, whereas storage at 25°C resulted in a rapid escalation of VBN and pronounced weight loss, particularly between days 3 and 6, indicative of accelerated spoilage. The extent of quality deterioration was significantly greater in the fin and tail regions compared to the center, with the fin portion exhibiting the most pronounced changes. These findings demonstrate that shelf life and spoilage dynamics are strongly influenced by both storage temperature and fillet portion. To ensure product safety and freshness, strict cold chain management below 5°C and portion-specific quality monitoring are recommended throughout processing and distribution. This research was supported by the Main Research Program (E0211001-05) of the Korea Food Research Institute (KFRI) funded by the Ministry of Science and ICT.

P1-16

Post-thaw quality deterioration in Atlantic salmon (*Salmo salar*) induced by extended freezing durations

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Frozen storage is widely used to preserve seafood, but prolonged storage may accelerate physicochemical deterioration. This study evaluated the effects of different freezing durations (0, 1, 5, 15, and 30 days at -18 ℃) on the post-thaw quality of Atlantic salmon (Salmo salar) during subsequent storage at 5℃ and 15℃. The quality parameters included drip loss, TBARS, TPA, and fatty acid composition. Drip loss increased significantly with longer freezing duration (0.48 ± 0.10 to 2.35 ± 0.28 g/100 g, $p < 0.05$), the TBARS values also increased from 0.43 to 0.93 mg MDA/kg. The texture properties deteriorated with longer freezing durations and higher refrigeration temperatures (5℃ and 15℃). The increase in PUFA and MUFA levels during storage could be due to the release of fatty acids from phospholipids, possibly caused by tissue disruption during thawing and storage. This led to higher levels of free PUFAs and total fatty acids. Although this differs from typical oxidative patterns, it may still be interpreted as a form of lipid degradation and is considered a sign of sensory quality decline. These findings suggest that freezing duration and post-thaw storage temperature influence the lipid composition and oxidative stability of salmon in a more complex manner than anticipated, underscoring the importance of comprehensive quality monitoring of frozen-thawed seafood. This research was supported by the Main Research Program (E0211001-05) of the Korea Food Research Institute (KFRI) funded by the Ministry of Science and ICT.

P1-17

Comparison of functional compounds and antioxidant activity in onion cultivars according to UV-B treatment and storage period

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This study was conducted to analyze changes in major functional compounds (quercetin and its glycosides) and antioxidant activity of onions according to cultivar and storage, and evaluated the potential application of UV-B treatment for their preservation. Red and yellow onions were stored at 1°C after harvest, and samples were taken at 4 and 8 months. The samples were peeled and sliced to 1 cm thickness, and exposed UV-B light (311 nm). Analysis showed that quercetin-3,4'-diglucoside (Q3,4'G), which exhibited the highest content, was present at 4.0-5.2 mg/g DW after 4 months, with the yellow onion having about 1.3 times higher content than the red onion. As storage progressed, the amount of Q3,4'G levels decreased in both cultivars, with a more pronounced reduction observed in UV-B-treated yellow onion. In contrast, the red onion showed little change with UV-B exposure. Quercetin 4'-glucoside (Q4'G) exhibited a similar trend to Q3,4'G depending on storage period and UV-B treatment. Quercetin 3-glucoside (Q3G) was about twice as high in the red onion compared to the yellow onion, and was not affected by UV-B exposure. Quercetin, present only in trace amounts, showed slight increase following UV-B treatment. Total phenolic content and antioxidant activity showed no significant difference between cultivars, but both decreased by more than 50% after 8 months compared to 4 months, with no observable change due to UV-B exposure. These results indicate that storage period and cultivar have significant effects on the functional compounds and antioxidant activity of onions, whereas UV-B treatment does not show a clear effect on their preservation. Therefore, further studies on the irradiation conditions and treatment methods are needed before UV-B treatment can be utilized as a technique to maintain these functional compounds. This work was supported by the Korea Food Research Institute [grant number E0211001].

P1-18

Evaluation of chilling injury in potatoes using hyperspectral imaging

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This study observed changes in potato quality after storing them at 1°C, 5°C, and 10°C for 60 days, followed by reconditioning at 18°C. At 10°C, reducing sugars remained stable, while cold-induced sweetening occurred below 5°C due to chilling injury, leading to higher sugar levels at lower temperatures. After reconditioning, sugar levels decreased at 5°C but remained high at 1°C, indicating potential irreversible damage. Total polyphenol content increased at 1°C, while levels at 5°C were similar to those at 10°C. The browning index of peeled slices increased significantly at low temperatures, while unpeeled potatoes showed minimal changes, making visual detection difficult. To address this, hyperspectral imaging was evaluated as a non-destructive method for classifying chilling injury. Based on quality traits, samples were categorized into NM (normal), CI1 (mild chilling injury), and CI2 (severe chilling injury). Partial least squares discriminant analysis of hyperspectral data showed high predictive power (Rp^2 = 0.900), confirming the capability of hyperspectral imaging to detect chilling injury. These findings support its use as a reliable, non-invasive tool for monitoring and classifying chilling injury in stored potatoes.

P1-19

Effects of herbal and general broth on the quality and fermentation characteristics of kimchi

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This study examined the effects of general and herbal broths on kimchi seasoning and the quality of fermented kimchi during storage. Herbal broths exhibited higher lightness, redness, yellowness, soluble solids, salinity, and titratable acidity, but lower pH than general broth, likely due to the presence of free sugars and organic acids in herbal ingredients. When applied to kimchi seasoning, the herbal broth caused minimal changes in color, salinity, and antioxidant activity, suggesting a limited impact on sensory properties. This indicates that herbal broth can be used in seasoning without negatively affecting consumer perception. During storage, kimchi prepared with herbal broth showed more stable soluble solids and maintained a higher pH and lower acidity during the early stages compared to kimchi made with general broth. Lactic acid bacteria counts remained stable until week 3, suggesting delayed fermentation and slower acidification. In conclusion, herbal broth at appropriate concentrations may enhance kimchi's storage stability by delaying fermentation while preserving visual and functional quality. These findings highlight its potential as a natural additive in the development of fermented foods requiring extended shelf life and consistent quality.

P1-20

Analysis of quality change based on storage conditions to set the use-by date of bakery breads

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In this study, the quality safety limit period of seven types of bakery bread was analyzed, and their use-by date was calculated. For evaluating product quality, storage condition were set as 5, 15, 25, and 35℃ for 50 days, and moisture, microorganisms and dominant bacteria were examined. The results showed that all products stored at 5℃ satisfied the standard for bacterial count for day 50, but the sensory quality was below the standard level. Samples stored at 15℃ showed high variability form 3-39 days. At 25℃, a quality safety limit period of 2-20 days was set, and on sample was found to have the same shelf life. Bread stored at 35℃ had the shortest quality safety limit period. Therefore, setting the use-by date according to the product type is necessary, even for the same product category. In the case of bread products sold at room temperature, storage temperatures of up to 35℃ are possible, so careful decisions must be made when setting the expiration date. Overall, this study demonstrates the importance of setting a quality retention period based on the product characteristics and storage temperature. Considering the safety margin of the manufacturer, it is thought that it can be used as the used-by date of bread in the future.

P1-21

국산 밀 품종의 함수율 변화에 따른 물리적 특성 비교

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국내 밀 재배 면적은 지속적으로 증가하고 있으며, 정부는 밀 산업 육성을 위해 다양한 지원 정책을 시행하고 있다. 우리나라의 밀 품종은 현재까지 40품종 이상이 육성되었으며 35품종 이상이 보급 재배되고 있다. 본 연구는 우리나라에 재배되고 있는 밀 품종 중 금강, 새금강, 조경, 백중의 물리적 특성을 비교하여 수확 후 처리 과정에 필요한 기계 및 설비의 설계와 최적화된 운영에 필요한 기초자료로 활용하고 관리 모델 개발을 위하여 연구하였다. 함수율이 감소함에 따라 비중, 동안식각, 천립중은 감소하였으며, 산물밀도, 장축, 단축, 두께, 면적은 증가하였다. 금강의 경우 산물밀도 및 비중에서 가장 큰 변화를 보였으며, 동안식각 및 두께는 조경, 천립중 및 단축은 백중, 장축 및 면적에서 새금강이 가장 큰 변화를 보였다. 결론적으로, 밀 품종에 따라 외형적인 특성 차이가 존재하였으며, 이는 함수율 변화에 대한 물리적 특성이 상이하게 나타난다는 점에서 수확 후 처리 공정에서 품종별 물리적 특성 차이를 고려한 설비 설계가 필요하며 향후 저장, 이송, 선별 장비의 구조 설계 및 최적화 모델 개발에 활용될 것으로 기대된다. 본 연구는 농촌진흥청 연구사업의 지원으로 수행되었다(RS-2025-02263107).

P1-22

Quality and morphological changes of tomatoes during ambient and cold storage according to fruit size grade

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Currently, tomato grading in APC relies mainly on fruit size, which does not fully reflect consumer preferences or postharvest quality. This study aimed to establish a more comprehensive grading standard by analyzing the impact of fruit size on postharvest quality under different storage temperatures. PLS-DA was performed using data on physicochemical traits across room temperature (RT, 20℃) and low temperature (LT, 10℃) storage. The score plot revealed distinct clustering by size and temperature, indicating that storability and sweetness varied with these factors. PC1 represented traits related to storability, such as titratable acidity (TA), hardness, and extraction rate, while PC2 reflected sweetness indicators like SSC and sugar/acid ratio. Larger fruits generally had higher TA and hardness, suggesting better storability, whereas smaller fruits had higher sugar/acid ratios, indicating greater sweetness. Microscopy supported these findings, showing more pronounced tissue collapse and intercellular space in S-sized fruits. These results highlight the importance of incorporating quality traits beyond size in grading standards. This study was carried out with the support "Cooperative Research Program for Agriculture Science and Technology Development (Project No. PJ01737102)" Rural Development Administration, Republic of Korea.

P1-23

High-humidity thermal stress effect for sweetpotato long-term storage

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To reduce the postharvest loss, sweet potatos were exposed under the high-humidity thermal stress in a storage chamber, known as curing. The curing treatment is able to reduce rot disease, weight loss, and the quality deterioration during the long term storage. Varing with curing conditions, the change of sweetpotato quality was investigated using the developed facility equipped with the forced air circulation system. Temperature and humidity of supplying air was adjusted in an additional chamber. The atmospherically controlled air was supplied to the main curing chamber through circulation ducks at 1.9 ~ 3.3 m/s wind speed. The temperature, humidity, and retention time of curing were 35 ℃, 95 %, and 3 days, respectively. During the curing process, sugar content was measured by a refractive glucose meter. After curing treatment, the quality change during 6 month storage (Nov.3~Apr.23) was repeatedly measured in once a month including sugar content (Brix), corruption rate (kg/total weight), weight loss rate (weight/initial weight). In special, cured at the 2.1±0.7 m/s of wind speed, corruption rate and weight loss rate have decreased by 25.5 % and 1.9 %, respectively. Dry lot occurrence significantly was reduced in comparison with that of the experimental control. This study was carried out with the support of the "Research program for Agricultural Sciences & Technology Development (project No. PJ01677818)", National Institute of Agricultural Sciences, Rural Development Administration, Republic of Korea.

P1-24

참외 슬라이스의 전처리 및 포장방법에 따른 저장 중 품질특성 변화

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참외(Cucumis melon L.)는 특유의 향과 단맛으로 여름철 대표 과채류로 소비되나, 주로 생과의 형태로 유통된다. 본 연구는 참외를 간편식 및 외식산업 소재로 활용하기 위한 기반 마련을 목적으로, 전처리 및 포장방법에 따른 저장 중 품질 변화를 분석하였다. 슬라이스 한 참외를 생물, 소금 절임, 소금설탕 절임으로 처리하고, 멸균수와 주정으로 세척한 후 -4℃에서 4일 및 8일간 저장하며 pH, 당도, 산도, 색도, 조직감을 평가하였다. pH는 멸균수 세척 시 높게 나타났으며, 당도는 저장기간에 따라 유의적으로 증가하였다. 산도는 주정 세척 시 높았고, 색도는 L값이 감소하며 저장 기간에 따라 과육의 밝기가 저하되었다. a값과 b값은 주정 세척 시 더 높게 나타났다. 조직감은 저장기간이 길어질수록 대부분 감소하였으나, 일부 절임조건에서 증가 경향이 관찰되었다. 후속 실험에서는 멸균수 세척 후 진공백 및 지퍼백 포장 조건을 비교하였으며, 진공포장이 조직감 및 색도 유지에 유리하였다. 본 연구는 참외를 식재료로 활용 시 저장성 향상 및 소비처 다변화를 위한 위한 기초자료로 활용될 수 있다.

P1-25

Effect of supercooling combined with corrugated carton packaging on kimchi quality during cold storage

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Kimchi is prone to quality deterioration during low-temperature storage due to temperature fluctuations associated with packaging configurations, often resulting in partial freezing and microstructural damage. This study investigated the effects of supercooling combined with corrugated carton packaging, which serves as a thermal and physical buffer to enhance storage stability. Kimchi was portioned into 400 g containers, precooled for 24 hours, packed in cartons (12 units per carton), and stored for 2 months under supercooling, refrigeration (4 °C), and freezing (-18 °C) conditions. Analyses included pH, titratable acidity (TA), hardness, microbial composition, and microstructural observations using scanning electron microscopy (SEM). Supercooled samples maintained stable pH and TA values, indicating delayed fermentation compared to refrigeration. The relative abundance of Latilactobacillus sakei gradually increased under supercooling, while it proliferated rapidly under refrigeration. SEM revealed severe microstructural collapse under freezing; in contrast, supercooling minimized tissue damage, resulting in the highest hardness values. These findings suggest that supercooling combined with corrugated carton packaging effectively delays fermentation, maintains microbial stability, and reduces structural damage in kimchi during cold storage.

P1-26

Quality of Korean melon under simulated export conditions: Effects of MA film and transport environment combinations

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Korean melon (*Cucumis melo L.*) is a popular fruit in export markets such as Hong Kong and Singapore. However, during 1-2 weeks of sea freight, quality loss from peel browning and decay leads to 30-40% rejection rates. To enable stable marine export as an alternative to costly air transport, this study evaluated the effects of modified atmosphere (MA) films and controlled atmosphere (CA) containers. Melons harvested from Seongju were washed, dried, and packed using (1) no film, (2) conventional film (20 μm OPP + 20 μm CPP), or (3) improved MA film (30 μm OPP, OTR 10,000 cc/m²/day). Simulated export was conducted using CA (5% O_2, 12% CO_2, 4°C, 85-90% RH) and refrigerated (RF) containers for 2 weeks, followed by storage at 10°C. CA transport reduced browning and decay in all packaging types. In the non-film group, CA-treated melons showed lower weight loss, ethylene, and respiration, with loss rates of 13.3% (CA) vs. 50.0% (RF). Gas levels inside films varied with film and transport type; improved films under CA maintained favorable low-O_2 and high-CO_2 conditions. After 2 weeks of transport and 4 days of distribution, loss rates for conventional-RF, conventional-CA, improved-RF, and improved-CA were 86.7%, 36.7%, 25.0%, and 12.5%, respectively, with marketable quality highest (87.5%) in the improved-CA group. No off-flavors were detected. These results indicate that combining CA transport with MA films improves postharvest quality and enables stable long-distance export of Korean melons. This work was supported by the Rural Development Administration (RDA), Republic of Korea, through the research program (Project No. RS-2023-00229042).

P1-27

CES System for providing food safety regulation information for major export countries and utilization of HS codes

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With the expansion of the global food market, Korea's food exports are steadily increasing. However, non-compliance cases are also rising, highlighting the need for systematic responses to increasingly complex international food safety regulations. To support exporters, the CES (Correct, Easy, Speedy) Food Database was developed. It provides structured, country-specific information on import conditions, safety standards, labeling requirements, and customs procedures. This helps businesses reduce non-compliance risks and avoid border delays. A key feature of the CES Database is the linkage between HS Codes and food product categories. Since product classification and regulatory interpretation vary by country, this linkage ensures consistency in customs procedures and tariff applications, reducing confusion and potential trade barriers. By offering accurate regulatory information, the CES Food Database enhances the efficiency of export planning and helps manage regulatory risks. As global trade regulations become more stringent, such an information-based support system is essential for boosting Korea's food export competitiveness.

P1-28

강일옥 저장온도 및 포장재에 따른 품질특성 비교

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옥수수(Zea mays L.)의 종류는 메옥수수, 찰옥수수로 나뉘어지는데, 메옥수수인 강일옥은 강원특별자치도에서 육성한 품종이다. 알곡상태로 수확후 저온에 보관하면서 가공재료로 사용된다. 년중 가공재료로 사용되는 강일옥의 최적 저장온도 및 포장재를 구명하고자 저장온도(0, 10, 20, 30℃) 및 포장재(PE, PP필름)별 품질특성을 비교하였다. 감모율은 0℃저장 6개월 PE, PP필름 각각 1%, 3.3%, 30℃저장 PE, PP필름은 각각 2.7%, 6.7%였다. 저온저장시 감모율이 현저히 낮아 저장중 손실이 적었다. 수분함량은 0℃저장 6개월 PE, PP필름 각각 15.2%, 12.9%, 30℃저장 PE, PP필름은 각각 11.7%, 6.2%였다. 저장온도가 높을수록 수분함량의 감소가 높았다. 색도 L값은 0℃저장 6개월 PE, PP필름 각각 64.3, 64.4, 30℃저장 PE, PP필름은 각각 55.6, 59.5로 30℃저장시 L값이 낮았다. 환원당 함량은 0℃저장 6개월 PE, PP필름 각각 0.20, 0.17, 30℃저장 PE, PP필름은 각각 0.19, 0.15였다. 전분 함량은 0℃저장 6개월 PE, PP필름 각각 56.8, 68.1, 30℃저장 PE, PP필름은 각각 69.3, 68.9였다. 포장재에 따른 차이는 PE필름이 수분유지력, 감모율, 색도유지에 유리하였다.

P1-29

Evaluation of quality attributes and Platycoside E retention in 3-year-old balloon flower (*Platycodon grandiflorum*) roots by grade during cold storage

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This study evaluated quality attributes and Platycoside E content of 3-year-old balloon flower (Platycodon grandiflorum) roots harvested from Goseong, Gyeongnam, Korea, which were classified clearly into grades: large (≥100 g), medium (≤20 g per root, ≥5 roots totaling ≤100 g), small (20-100 g per root, ≤5 roots), extra small (≤50 g), and non-marketable (non-standard). Roots were stored at 0℃ for 13 weeks, during which weight loss rate, respiration rate, firmness, color parameters (L*, a*, b*, whiteness index, browning index), moisture content, and Platycoside E content were periodically measured. As storage duration increased, the extra small and non-marketable grades showed rapid mold growth and decay within 4-7 weeks, leading to significant sample loss. Partial decay in the medium and large grades was also observed after 9-10 weeks, indicating limitations for long-term storage. Analysis prior to decay indicated that respiration and weight loss rates increased most significantly in the extra small and non-marketable grades, whereas the large, medium, and small grades exhibited relatively smaller changes, demonstrating higher storage stability. During the later stages of storage, all grades exhibited decreasing L* values and whiteness indices, with increasing a* values and browning indices, indicating deterioration in external quality. Firmness also gradually decreased in all grades throughout the storage period. Platycoside E content progressively declined across all grades after 6 weeks of storage, with greater reductions observed in grades exhibiting higher weight loss and respiration rates. Correlation analysis revealed significant negative correlations between Platycoside E content and both weight loss and respiration rates, whereas moisture content showed a positive correlation. These findings empirically demonstrate the importance of grade classification and systematic cold storage management for maintaining balloon flower quality, and provide fundamental scientific data supporting national quality management systems and industrial utilization. This study was supported by the Rural Development Administration research project No. PJ01737105

P1-30

저장 방법에 따른 생천마의 품질특성 및 저장성 평가

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생천마(Gastrodia elata Blume)는 저장기간이 1개월 미만으로 수확기 홍수 출하기 수급 조절을 위한 장기저장 기술개발이 필요하다. 본 연구는 저장 방법에 따른 생천마의 품질 및 저장성 평가를 위해, 전북 무주에서 2021년 가을에 수확한 천마를 2.5kg단위로 PE망포장을 한 후 10kg PE 상자에 4망씩 담아 저온(0℃), 저온(0℃)+유황패드, CA(0℃, 5±1% O2, 10±1% CO2) 및 DCA 챔버(0℃, 4±1% O2, 2±1% CO2, RQ=0.8)에 16주간 저장하면서 2주 간격으로 품질을 조사하였다. 중량감소율과 부패율이 높았던 저온저장의 상품성유지기한이 4주로 가장 짧았으며, CA와 DCA저장은 12주까지 양호한 품질을 보였다. 외관품질을 나타내는 색도는 CIE L*값은 감소, CIE b*값은 증가하는 경향을 보였고, 경도는 DCA저장에서 가장 높게 나타났다. 총폴리페놀과 총플라보노이드 함량은 저장 중에 다소 증가하였으며, 항산화 활성 변화와 높은 상관관계를 보였다. 주요 약리성분인 gastrodin은 CA저장, 4-HBA은 저온저장에서 높게 나타나 저장방법에 따른 차이를 보였다. 생천마의 장기저장에 CA 및 DCA저장이 효과적이었으며, 부패균 제어를 위한 저장 전 살균, 큐어링과 같은 전처리 기술의 개발이 필요할 것으로 판단된다. 본 성과물은 2024년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호 PJ01675502)의 지원에 의해 이루어졌다.

P1-31

능동형 CA저장에 따른 가을배추의 품질 및 저장성 평가

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능동형 CA(Dynamic controlled atmosphere, DCA)저장은 농산물의 생리상태에 따라 기체 환경을 제어하는 기술로 일반 CA저장 대비 장해발생율을 최소화하고 신선도 유지기간을 연장시키는 장점이 있다. 본 연구는 DCA 저장 시스템 품목 확대 적용을 위해 전북 완주군에서 재배된 가을배추 '춘광'(24년 11월 수확)을 17주간 저온(0℃, 95% RH) 및 DCA(0℃→12주 후 2℃, 산소 5±1%, 이산화탄소 8±2%, 호흡률=1)저장을 하면서 4주 간격으로 품질 및 저장성을 평가하였다. 저장 17주에 중량감소율은 저온저장은 32.6%인 반면, DCA저장은 10.4%이었으며, 이로 인해 DCA저장 배추에서 정선 후 수분함량과 중륵 부위의 경도가 높게 나타났다. 당도와 적정산도는 중량감소율에 비례하여 증가하였는데 이러한 경향은 저온저장 배추에서 더 뚜렷하게 나타났다. DCA저장은 정선손실률을 감소시키는데 효과적이었으나, 저장 8주 후 중륵 갈변에 의해 정선손실률이 급격하게 증가하였으며, 저장 12주에 온도를 2℃로 올린 후 17주차에 중륵 갈변이 더 이상 진행되지 않는 것을 확인하였다. 이상의 결과로, DCA저장 시스템은 가을배추의 저장에 효과적이나, 장기저장에 따른 중륵 갈변 방지를 위한 연구가 필요하다. 본 연구는 2025년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호:PJ01677851)에 의해 이루어졌다.

P1-32

지역별 사과의 재배환경과 능동형 CA저장에 따른 품질 특성 비교

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이상기후로 인한 사과 '후지'의 조기 개화와 생육기간 연장은 품질 변화를 초래하고 있다. 본 연구는 기상환경에 따른 지역별 사과의 품질과 능동형 CA저장에 따른 저장성을 비교하였다. 충북 보은, 전북 장수, 경북 청송지역의 생육기간(4~10월) 기후에 따른 품질을 비교한 결과, 과중은 최저기온이 낮고 10월 강수량이 많은 보은 사과가 가장 컸고, 평균기온이 낮은 장수 사과의 경도가 높았다. 당도는 8월 이후 일조시간이 길고 고도가 높은 장수 사과가 높았고, 4~7월 유과기의 최저기온이 높고 일교차가 작은 청송 고지대 사과의 산도가 높았으며, 과피의 적색도는 10월 평균기온이 낮고 일조시간이 긴 보은 사과가 높았다. 지역별 사과를 240일간 능동형 CA저장을 한 결과, 경도는 120일 이후 감소하는 추세로 보은 사과에서 변화폭이 크게 나타났고, 산도의 감소는 초기 산도가 높았던 청송과 장수 사과에서 뚜렷하게 나타났으며, 이로 인해 당산비는 크게 증가하는 경향을 보였다. 과피의 색변화를 나타내는 ΔE값은 보은 사과에서 가장 높았고 청송 고지대 사과에서 가장 낮았다. 이상의 결과로 지역별 기상환경에 따라 사과의 수확 시 품질과 저장성에 차이가 있음을 확인하였으며, 추후 재배이력에 기반한 사과의 품질예측모델 구축을 위한 기초자료로 활용될 수 있을 것으로 기대된다. 본 성과물은 2025년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호:PJ01762103) 및 전문연구원 과정 지원 사업에 의해 이루어진 것이다

P1-33

Changes in quality characteristics of dried persimmons during storage according to packaging materials

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This study was conducted to analyze the effects of various types of packaging materials on the quality characteristics of dried persimmons. Dried persimmons are known for their excellent nutritional components and health functionalities; however, they are susceptible to quality deterioration due to moisture absorption and microbial proliferation. In this experiment, three types of packaging materials; polypropylene (PP), polyethylene (PE), and oriented polypropylene (OPP) were used, and the samples were stored at -25°C for 16 weeks to compare changes in quality. Results showed that moisture content and water activity, displayed the highest increase in dried persimmon stored with PE with the values of 39.11% and 0.788, which were significantly higher when compared to dried persimmon samples stored in PP and OPP. Furthermore, dried persimmon packaged with PE showed more pronounced quality deterioration in terms of total soluble solids (TSS), browning index, and color compared to those stored packaged with PP and OPP. The lowest TSS was observed in samples packaged with PEwith a value of 52.2, while the dried persimmon stored packaged with PP and OPP recorded a batter value of 52.8% and 53.4% respectively. The microbial analysis showed similar trends in yeast, mold, and total bacterial counts, with the highest microbial counts recorded in dried persimmon samples packaged with PE with a yeast and mold count of 0.69 log CFU/g and bacteria count of 0.72 log CFU/g at the the end of the storage period. Overall, OPP packaging effectively inhibited moisture migration and exhibited superior quality retention compared to PP and PE. The results of this study highlights the importance of appropriate packaging materials in extending the shelf life and improving the quality of dried persimmons, and may serve as fundamental data for quality management and distribution stability of dried persimmon products.

P1-34

Effect of various storage temperatures on the quality characteristics of dried persimmons

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This study was conducted to analyze the effects of various storage temperatures on the quality characteristics of dried persimmons packaged with polyoropylene (PP). In this experiment, dried persimmons packaged with PP were stored under various temperature conditions of 25°C, 0°C, -25°C, -40°C ~ -25°C, and -70°C ~ -25°C for 16 weeks to compare changes in quality. Among these, the samples stored at -40°C -25°C and -70°C -25°C were subjected to rapid freezing at -40°C and -70°C for 24 hours, followed by long-term storage at -25°C. Results showed that moisture content and water activity, displayed the highest increase in samples stored at 25°C. The moisture content and water activity by the end of the storage period were measured to be 42.12% and 0.798,which were significantly higher when compared to dried persimmon samples stored at other storage temperatures. Furthermore, samples stored at higher temperatures showed more pronounced quality deterioration in terms of total soluble solids (TSS), browning index, and color compared to those stored at lower temperatures. The lowest TSS was observed in samples stored at 25°C, with value of 51.6% while those stored at -40°C ~ -25°C, and -70°C ~ -25°C recorded the highest values of 54.4% and 55% respectively. The microbial analysis showed similar trends in yeast, mold, and total bacterial counts, with the highest microbial counts recorded in dried persimmon samples stored at 25°C. Yeast and mold counts reached up to 12.12 log CFU/g, while total bacterial counts reached up to 9.79 log CFU/g. The results of this study highlight the importance of appropriate storage temperature conditions for extending the shelf life and improving the quality of dried persimmons.

P1-35

Development and application of poly(butylene adipate-co-terephthalate) composite film with copper oxide nanoparticles for prevention of greening in potatoes

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In this study, we developed an eco-friendly packaging film to inhibit potato greening by blending various organic and inorganic fillers into PBAT via solvent casting. Among them, the PBAT film containing CuONPs exhibited the lowest UV-visible light transmittance, prompting further investigation. Three major potato cultivars ('Superior', 'Duback', and 'Eunsun') were packaged using the CuONPs composite films, while the unpackaged sample, HDPE film, and neat PBAT film were used as controls. After exposure to fluorescent light for 6 days, the CuONP composite films effectively inhibited the greening of 'Duback' and 'Eunsun'. SEM and XRD analyses showed that CuONPs were uniformly dispersed without changing the crystallinity of PBAT. The mechanical test results showed similar elongation and elastic modulus to those of neat PBAT, and the tensile strength was comparable to that of LDPE. FT-IR analysis results showed no chemical interaction, suggesting physical bonding. In addition, the CuONPs composite film exhibited excellent water vapor permeability. These results demonstrate the potential of this film to reduce waste of photosensitive agricultural products and improve food safety.

P1-36

Development and characterization of a light-blocking biodegradable layered packaging film for preventing potato greening

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This study aims to develop a biodegradable packaging material to prevent potato greening during storage and distribution. Exposure to light induces chlorophyll accumulation, resulting in greening, quality degradation, and increased levels of toxic glycoalkaloids. To address this, a PBAT-PLA (98:2) composite film (PPCF) with high mechanical strength was fabricated. To enhance light-blocking properties, a hydrophobic black pigment was added to produce PPCF-black (PPCF(B)). Additionally, a gelatin-white film (Gel(W)) containing TiO_2 pigments was prepared and laminated onto PPCF(B) to form the final black-and-white (B&W) multilayer film. The films were evaluated for light transmittance, tensile strength, water vapor and oxygen permeability, along with structural and morphological assessments using SEM, FTIR, and XRD. Through lamination with Gel(W), the B&W film achieved high water vapor permeability and low oxygen permeability. It effectively blocked oxygen contact and reduced heat from potato respiration while releasing transpired moisture, maintaining a stable storage environment. After 12 days of light exposure, greening was significantly reduced, confirming the film's effectiveness in preserving potato quality and extending shelf life.

P1-37

Development of biodegradable film using corn husks and study on improving the oxidation stability of edible oil

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The development of packaging materials utilizing agricultural waste as biodegradable food packaging is gaining increasing attention, as it reduces environmental burden while supporting sustainability and food quality. This study aimed to enhance the value of agricultural waste through the extraction of microcrystalline cellulose (MCC) from corn husk powder (CHP) and its incorporation as an additive to improve the functional properties of κ-carrageenan-based films. MCC obtained via acid hydrolysis exhibited improved crystallinity, and FT-IR analysis confirmed the effective removal of lignin, hemicellulose, and amorphous components. SEM and thermal analyses (TGA, DSC) showed that the extracted MCC had structural and thermal properties comparable to commercial MCC. All films were confirmed to be biodegradable in soil within 30 days. In edible oil storage tests, CAR/MCC0.5% and CAR/MCC1% films exhibited greater oxidative stability than pure carrageenan film. Among them, CAR/MCC0.5% showed the greatest improvements in mechanical strength, oxygen and UV barrier properties, and thermal stability. These results suggest that corn husk waste is a valuable resource, and MCC has strong potential as a functional additive in eco-friendly polymer applications, particularly for food packaging.

P1-38

기계수확 양파 장기저장을 위한 매시팰릿 구조에 따른 저장성 평가

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정부의 밭작물 스마트 기계화 모델 보급에 따라 기계수확 양파의 수확 후 처리를 연계한 벌크 단위 저장기술 개발이 요구되고 있다. 현재 관행적인 벌크 저장 방식은 톤백 및 매시팰릿을 활용하지만, 공기 흐름이 원활하지 않아 저장 중 무름, 곰팡이 등 생리적 장해와 부패가 발생하는 문제가 있다. 이에 본 연구에서는 기계 수확 양파의 장기 저장을 위한 매시팰릿 구조별 저장성을 평가하였다. 실험에 사용된 양파는 해남에서 수확하였으며, 국립농업과학원의 저온저장고에서 0℃ 조건으로 245일간 저장하였다. 대조구(20 kg 망저장)와 500kg 매시팰릿, 공기 유로를 적용한 500kg 매시팰릿을 각각 비교하여 저장성을 분석하였다. 저장 성능은 저장 기간 중 경도, 가용성 고형물, 함수율 등의 품질 변화와 전수조사를 통한 부패율을 조사하여 평가하였다. 저장 기간 동안 모든 처리구에서 경도와 가용성 고형물은 감소하는 경향을 보였고, 함수율은 유의미한 변화가 없었다. 매시팰릿 저장 시 공기 유로를 적용한 처리구에서 중앙부 부패율이 감소하는 경향을 나타냈다. 본 연구 결과는 향후 양파 전과정 기계화 및 벌크 단위 저장성 향상을 위한 기초자료로 활용될 수 있을 것으로 기대된다. 본 연구는 2025년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호:PJ01745901) 및 전문연구원 과정 지원 사업에 의해 이루어졌다.

P1-39

Non-destructive discrimination of stored avocado using hyperspectral imaging and chemometrics

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Over the recent years, the nutritional value of avocados has gained considerable recognition, leading to increasing consumption. However, being a tropical fruit, avocados are prone to postharvest issues such as peel discoloration, weight loss, and spoilage during storage and transportation, which are closely associated with their ripening and senescence processes. Consequently, postharvest quality plays a crucial role in the marketability, consumer acceptability, and shelf life of avocados. This study aimed to nondestructively identify the ripeness of post-harvest avocados by applying hyperspectral imaging (HSI) in the visible to near-infrared range (400-1000 nm) and the short-wave infrared range (1000-1700 nm). A total of 400 samples (100 per avocado) were collected, with 70% used for training and 30% for testing. Spectral data were normalized and analyzed using partial least squares discriminant analysis (PLS-DA), achieving Rc2 values of 0.8919 in VIS-NIR and 0.8571 in SWIR, with classification accuracy of 85% and 57.86%, respectively. These results demonstrate that the combination of HSI and chemometric modeling provides a reliable and non-destructive method for real-time verification and quality control during avocado ripening and senescence. This work was supported by the Main Research Program (E0211001-05) of the Korea Food Research Institute (KFRI), funded by the Ministry of Science and ICT in South Korea.

P1-40

후지사과를 이용한 호흡률 기반의 능동형 CA저장고 운전특성 분석

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기후변화에 따른 농산물의 수급 불균형이 가격폭등으로 이어져 사과, 배추 등 농산물의 장기저장기술에 대한 중요성이 커지고 있다. 본 연구에서는 농산물의 호흡률(RQ)을 측정하고 이를 바탕으로 CA저장환경 능동제어하는 특성을 관찰하였다. 호흡률은 최신 장기저장기술인 능동형 CA(DCA)의 적정산소농도 설정을 위한 기체환경 관찰값이며, 이산화탄소 변화량과 산소변화량의 비로 계산된다. 장치는 농촌진흥청에서 개발한 능동형 CA저장고(10㎥)와 질소발생기를 활용했고, 시료는 3개지역(보은, 장수, 청송)에서 구입한 후지사과 1.2 ton을 저장했다. 저장환경 분석결과 온도 0.1℃ ±0.4, 습도 93.1%RH±8.9, 산소 6%±7.6, 이산화탄소 0.5%±0.3를 유지하였다. 이때 호흡률은 평균 1.3으로 이론값보다 0.3 높게 나타났다. 이는 기밀도(airtightness)와 입고량이 산소변화량에 영향을 준것으로 판단된다. 호흡률의 변화에 따라서 산소농도의 설정값은 자동변경 되었고, 산소농도는 새로 설정된 값에 맞춰 자동제어 되었다. 호흡률 변화는 농산물의 호흡뿐만 아니라 저장고의 기밀도와 입고량 등 영향력이 관찰되었다. 따라서 호흡률에 의한 능동제어는 농산물의 호흡 뿐만 아니라 저장고의 물리적 특성도 고려되어야 할것으로 판단된다. 본 연구는 2025년도 농촌진흥청 국립농업과학원 농업과학기술 연구개발사업(과제번호:PJ01762101)에 의해 이루어졌다.

P1-41

Development of bio-adhesives using cellulose-protein-polyphenol

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Biopolymer-based adhesives are gaining attention as sustainable alternatives to synthetic glues, especially in food applications where safety and biodegradability are essential. This study reports the development of HPMC (H)-based hydrogels reinforced with zein (Z)-tannic acid (T) complexes to enhance adhesive performance. ZH-T (2%) exhibited a notable increase in gel strength, rising from 48.84 ± 2.87 gf·cm to 80.80 ± 1.83 gf·cm. Adhesion strength more than doubled at room temperature (from 27.14 MPa to 49.35 MPa) and reached 3.05 GPa under elevated temperatures. Water resistance improved significantly, with swelling and degradation both reduced to below 4%, and water retention maintained above 90% over 30 hours. The contact angle increased from 36.07° to 50.67°, indicating enhanced hydrophobicity. Rheological analysis showed that ZH-T (2%) possessed the highest storage modulus (G′) and exhibited shear-thinning behavior, supporting its applicability in processing. These findings highlight the composite hydrogel's excellent mechanical strength, moisture barrier, and functional performance, underscoring its promise as a biodegradable and edible adhesive for eco-friendly food packaging applications. This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through Agriculture and Food Convergence Technologies Program for Research Manpower development, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA)(RS-2024-00402136)

P1-42

Optimization of fresh-cut mixed fruit composition using CO_2 concentration to extend shelf life in apple-grape blends

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The fresh-cut fruit market has been expanded to include various multi-component blends. However, optimal fruit combinations and mixing ratios for shelf-life extension have not been clearly identified. In this study, an optimal mixing ratio was investigated using two apple cultivars ('Arisoo' and 'Summer King') and one grape cultivar ('Shine Muscat') in a fresh-cut blend. Ten weight-based combinations were prepared and stored in sealed fresh-cut containers at 10°C. CO_2 concentration, respiration rate, ethylene production, and physicochemical quality were monitored over a 6-day period. The highest initial respiration rates were observed in 'Summer King' apples and 'Shine Muscat' grapes, with values of 15.1 ± 2.1 and 10.7 ± 4.0 $mL \cdot kg^{-1} \cdot h^{-1}$, respectively. The greatest ethylene production was measured in 'Summer King' (101.6 ± 8.6 $\mu L \cdot kg^{-1} \cdot h^{-1}$). These fruits also resulted in the highest CO_2 accumulation inside the packaging. Strong correlations were found between CO_2 levels and respiration rate (r = 0.95 for apple, r = 0.93 for grape), and elevated CO_2 was associated with enhanced browning in apples and softening in grapes. Through heatmap analysis, apple browning and grape firmness were identified as the most affected quality parameters influenced by initial respiration. Based on simple lattice analysis of CO_2 accumulation, the 3:1:3 (Arisoo:Summer King:Shine Muscat) combination was selected as the most favorable among tested treatments, while the 3:2:2 ratio was predicted as optimal. It is suggested that headspace CO_2 concentration can be utilized as a practical indicator for optimizing component ratios and for modeling shelf-life prediction in fresh-cut mixed fruits. This work was carried out with the support of "Project No. RS-2022-RD010023", Rural Development Administration, Korea.

PART II Food Processing and Quality

P2-01

Quality comparison of strawberry cultivars (seolhyang, kingsberry, vitaberry)

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Strawberries (*Fragaira nanassa*) were purchased by variety(seolhyang, kingsberry, and vitaberry) from a local food store in nonsanin January 2025 and freeze-dried. The general components, physicochemical properties, and vitamin C content of each strawberry variety were analyzed to investigate the functionality of these cultivars and their potential use as processing materials. The moisture, protein, and fat contents were highest in the seolhyang variety at 11.08%, 7.39%, and 1.46%, respectively, and the sugar content was highest in the vitaberry variety at 8.50°Brix. The pH of strawberries by variety ranged from 3.56 to 3.63, and the total polyphenol and total flavonoid contents were the highest in the vitaberry variety at 128.01 GAE mg/100mL and 32.01 RE mg/100mL, respectively. Through these results, it was determined that among the strawberry cultivars grown in the chungnam region, the vitaberry variety showed a high vitamin C content and thus has high potential for use as a functional food material, and that the seolhyang and kingsberry cultivars could also be used as various processed materials due to their unique ingredient compositions.

P2-02

Quality characteristics according to the manufacturing process of simple strawberry shake

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Strawberries (*Fragaira nanassa*) are mainly distributed as fresh fruit and have limited storage life. In addition, it is necessary to develop products that can increase the usability and added value of strawberries that have no commercial value. In this study, strawberry powder, sugar, and milk were added after hot air drying at 40, 45, and 50℃, and then the preference was investigated. Through this, a shake was mixed by adding five ingredients including yogurt, sugar, vegetables, and oatmeal to strawberry powder (50℃, hot air dried), which had the highest preference. As the amount of strawberry powder (50℃, hot air dried) added increased, the sugar content, redness, and vitamin C content increased, while the pH decreased. The preference was high when yogurt, vegetables, and oatmeal were added. And, among the sugars, the preference was the highest when sugar was added, and the vitamin C content was 164.11 mg% when allulose was added. The protein content of the strawberry shake with added milk was 4.02%, the sugar content was 17.90°Brix, the pH was 4.93, and the vitamin C content was 154.81 mg%. The results of this study are intended to provide basic data that can be helpful in the development of products using hot air-dried strawberry powder in the future.

P2-03

IQF냉동(개별급속냉동) 공정기술을 적용한 전복톳밥의 보관 품질 특성

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우리나라 총 인구수의 감소, 가족 구성원 형태의 변화와 포스트 코로나 시대로 인한 비대면 소비가 일반화 되며 식품의 유통환경이 급격하게 변화되고 있다. 특히 1인가구 비중이 증가됨에 따라 전복톳밥과 같은 간편 가정식의 가공제품 포장 유통 기술이 함께 변화되고 있다. 본 연구에서는 전복톳밥 제품을 용기형태별로 구분하여 IQF냉동처리함에 따라 일반냉동보관 제품과 맛, 향, 식감 변화를 비교함으로서 동결처리 형태에 따른 품질 변화를 탐색하였다. 향과 맛의 변화는 전자코, 전자혀를 통해 분석하였고 외관, 향, 맛, 질감 및 전체 기호도는 관능평가를 실시하였다. 주 원료인 손질된 전복은 IQF냉동과 일반냉동 보관 후 가공 특성을 비교하였다. 전자코는 유사한 패턴의 결과로 품질변화가 없는 것으로 보이며 전자혀의 경우 일반냉동 제품이 제조 직후 제품, IQF냉동처리 제품과 감칠맛의 차이가 있는 것으로 확인되었다. 관능평가의 경우 제조 직후 제품, IQF냉동처리 제품 순으로 선호도가 높았으며 일반냉동보관 제품의 선호도가 가장 낮아 제조 직후 제품과 가장 큰 품질 변화를 보였다. 손질 전복 원료는 IQF냉동처리 원료 가공 시 생 전복에 가까운 품질 상태를 확인하였다. 본 연구는 농림축산식품부의 재원으로 한국식품산업클러스터 진흥원의 지원을 받아 수행되었다(SPCVNO_2025_00000044).

P2-04

Quality characteristics and antioxidant characteristics of yellow-type sweet potato according to different cultivars

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This study investigated quality characteristics, phenolic compounds and radical scavenging activity of yellow-type sweet potato cultivars. The sweet potatoes (19 cultivars) were grown during the 2023 at the Value Crop Research Institute, National Institute of Crop and Food Science, RDA, Muan, Korea. L-, a- and b-value were 80.92~88.65, -1.04~6.91 and 11.77~20.62, respectively. The water absorption, water binding capacity, water solubility index and swelling power were 101.35~153.68, 135.61~254.27, 27.59~83.75 and 7.02~13.90%, respectively. Total polyphenol content of cv. Yeseumi was 320.97±6.23 mg gallic acid equivalents/100 g sample, which was higher than that of other cultivars, and total flavonoid content of cv. Hayanmi was the highest at 202.00±7.00 mg catechin equivalents/100 g sample. DPPH and ABTS radical scavenging activities were 29.05~262.20 and 143.24~318.69 mg trolox equivalents (TE)/100 g sample, respectively. DPPH and ABTS radical scavenging activities of cv. Yeseumi were 262.20±3.42 and 318.69±30.40 mg TE/100 g sample, respectively. The study results revealed a positive correlation between quality characteristics and antioxidant characteristics. It is thought that these results can be used as basic data for sweet potato processing and breeding. This work was carried out with the support of "Research Program for Agriculture Science and Technology Development (Project No. PJ01726701)" Rural Development Administration, Republic of Korea.

P2-05

Quality evaluation of commercial and reformulated Bulgalbi sauces with variable raw ingredients

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This study aimed to evaluate what effects specific ingredients have on the umami of *bulgogi* sauce, focusing on varying addition levels. Nine commercial sauces were subjected to quality analysis and electronic tongue (e-tongue) profiling. Consistent sensory patterns were observed in samples from the same manufacturer, indicating that flavor differences were mainly driven by manufacturer-specific formulations, regardless of *gochujang* addition. Seven raw ingredients linked to sweetness, sourness, and saltiness were selected and varied in concentration to assess sensory impact. The control sample exhibited acidity of 0.12%, while experimental formulations ranged from 0.27% to 0.38%. The highest pH value (5.58) was recorded in the control, and lowest in the *gochujang* sample. Soy sauce showed 2.50% total and 3.67% reducing sugars, highlighting its underestimated sweetness contribution. The highest salinity (4.97%) was detected in *dashida*, while the highest NaCl (6.92%) was in *gochujang*. These results demonstrate clear quality differences between control and improved samples and identify soy sauce and *gochujang* as critical factors in umami perception. Future studies will refine ingredient addition levels and use e-tongue analysis to establish quantitative links with sensory attributes.

P2-06

Comparative analysis of Okara fiber composition and physicochemical properties according to protein removal strategies

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Okara, a by-product of soybean processing, is being actively explored as a fiber material for use in industrial polymer applications. In this study, protease hydrolysis alone or in combination with ultrasound-assisted pretreatment was applied to defatted okara to evaluate the effects of different protein removal strategies on the compositional and physicochemical properties of purified okara fiber. Analysis of fiber constituent sugars revealed that enzymatic hydrolysis alone resulted in higher total sugar content, while the ultrasound-assisted enzymatic treatment enhanced structural modification of the fiber matrix. Although no significant differences in residual protein content were observed between treatments, FT-IR spectra showed a clear decrease in amide I (1650 cm^{-1}) and amide II (1540 cm^{-1}) peaks, confirming efficient protein removal. Functional groups related to polysaccharide structure, such as -OH and -COOH, were preserved in all samples. Rheological evaluation demonstrated that the combined ultrasound-enzyme treatment achieved the highest storage modulus (G′ 〉 1,200 Pa), indicating improved viscoelasticity and network strength of the fiber gel. These findings highlight the importance of tailored pretreatment strategies in improving the structural and functional properties of okara fiber for potential industrial applications.

P2-07

Development of a quality sorting system for oriental melons using 3-D image reconstruction techniques

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As consumer demand for high-quality agricultural products continues to grow, there is an increasing need for advanced sorting technologies to accurately classify quality grades. Conventional sorting methods employed at Agricultural Processing Centers (APCs) and farmers' cooperatives typically rely on size, shape, color, and weight. For external quality assessment, 2-D imaging systems are commonly used. However, they offer limited accuracy in evaluating properties such as volume and density. To address these limitations, we developed a 3-D image reconstruction-based sorting system for detecting water-soaked and deformed oriental melons. A total of 5 RGB-D camera were used for 3-D reconstruction, with one positioned above and the remaining four on the sides of the fruit. By integrating 3-D reconstructed images with weight measurements, water-soaked oriental melons were classified with an accuracy of 94%, while deformed oriental melons were identified with an accuracy of 95%. Based on these findings, a conveyor-based sorting system equipped with trays was developed. This system classifies oriental melons into four categories: normal (large), normal (medium), water-soaked, and deformed. The overall sorting accuracy exceeded 95%. These results demonstrate that 3-D imaging reconstruction technology is a viable and effective tool for quality assessment and automated grading of agricultural products. This study was carried out with the support of "Cooperative Research Program for Agricultural Science & Technology Development (Project No. RS-2022-RD010265)", Rural Development Administration, Republic of Korea.

P2-08

Quality characteristics of Nuruk and analysis of volatile compounds in makgeolli

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The purpose of this study was to evaluate the quality characteristics of nuruk (*koji*) produing different raw materials. Three raw materials—rice, barley, and wheat—were used, and *Aspergillus luchuensis* 34-1 (KACC No. 46420) isolated from traditional *nuruk* was employed as the inoculating strain. To assess quality, inner temperature, pH, acidity, amino acidity, enzyme activity, organic acids, free sugars, and free amino acids was measured. Volatile compounds in *makgeolli* brewed with each *nuruk* type were analyzed using gas-chromatography. Saccharification power showed significant difference among *nuruk*, and barley *nuruk* showed the highest activity at 810.76 U/g. Aerobic bacteria levels were lower in barley *nuruk* compared to wheat *nuruk*. Analysis of volatile compounds revealed that phenylethyl alcohol was present in the highest concentration in *makgeolli* brewed with barley *nuruk* (5.44mg/L), compared to those made with rice and wheat *nuruk*(2.20mg/L, 2.54mg/L). Consumer acceptance tests showed that *makgeolli* brewed with barley and rice *nuruk* received higher aroma preference scores. These findings suggest that barley *nuruk* inoculated with 1% starter produces high-quality *nuruk* with enhanced enzyme activity and higher concentrations of preferred volatile compounds. Furthermore, the use of barley *nuruk* may improve the flavor profile of *makgeolli* compared to other raw materials

P2-09

천연 발효종의 생리활성 검정 및 이를 함유한 건강기능성 빵 품질 특성 비교

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본 연구에서는 천연발효종으로부터 발효 미생물을 순수 분리하여 분자생물학적으로 동정하고, 천연발효종이 가지는 기능성 중 항산화 생리활성을 검정하였으며, 천연발효종을 농도별로 첨가한 식빵의 품질 특성 변화 및 관능 평가를 실시하였다. 천연발효종으로부터 순수 분리한 대표 균주 2종의 염기서열을 분석한 결과, *Saccharomyces cerevisiae*와 *Acetobacter* 속으로 동정되었다. 천연발효종으로부터 열수와 80% ethanol 추출물을 제조하여 동결건조하여, 이들 동결건조물을 12.5-100 mg/mL 농도로 조절하여 DPPH, ABTS, Antioxidant protection factor, TBARs 등 항산화 활성 지표를 측정한 결과, 80% ethanol 추출물이 열수 추출물보다 우수한 항산화 활성을 나타내었다. 한편, 천연발효종을 0-30% 농도로 첨가하여 제조한 식빵의 품질을 평가한 결과, 대조구(0%)의 pH는 5.61±0.01인 반면, 첨가 농도가 증가할수록 pH는 감소하여 30% 첨가군에서는 pH 5.41±0.00로 나타났다. 기계적 물성 측정 결과, 10% 첨가군까지는 탄력성과 경도가 대조구와 유사한 수준이었으나, 그 이상의 농도에서는 물성이 저하되어 품질에 영향을 줄 수 있음을 확인하였다. 관능 평가 결과, 전체적인 기호도는 10% 첨가군에서 6.92±1.41점으로 가장 가장 높게 나타났으며, 이상의 결과를 종합할 때, 천연발효종의 식빵 내 적정 첨가량은 10% 수준이 가장 적합한 것으로 판단된다.

P2-10

Physicochemical comparison of Makgeolli fermented with Y263 yeast to select brewing barley varieties

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The purpose of this study was to analyze the physicochemical properties of *Makgeolli* brewed using various barley varieties. The barley varieties used for brewing analysis were *Hinchalssalbori, Hopum, Gwangmaeg, Saessalbori, Nulichal, Heukbochal, Hogang, Ssagirang, Keunalbori-1,* and *Hangang*, all developed by the National Institute of Crop and Food Science. As a result, *Makgeolli* made from waxy barley such as *Hinchalssalbori, Nulichal*, and *Heukbochal* exhibited higher CO_2 emissions and fermentation efficiency. Filtration yield and alcohol content ranged from 66.06-80.78% and 14.20-15.73%, respectively, with both parameters being higher in *Makgeolli* derived from waxy barley. Soluble solids, reducing sugars, and sugar-acid ratios, which contribute to sweetness, were higher in *Makgeolli* made from Ssagirang and Keunalbori-1. Additionally, these varieties showed higher free sugar contents, measuring 5595.55 and 6081.03 mg/100 mL, respectively. Lactic acid was identified as the predominant organic acid, with the highest concentrations detected in *Makgeolli* made from *Hogang* and *Hangang*, at 410.72 and 416.60 mg/100 mL, respectively. This study is expected to help evaluate the quality of *Makgeolli* production and select suitable barley varieties for brewing.

P2-11

Comparative physicochemical characteristics of mash for selecting barley cultivars for distilled Soju using N9 yeast

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This study aimed to investigate the physicochemical characteristics of mash prepared from various barley cultivars for distilled soju production. The barley cultivars used for brewing included Hinchalssalbori, Hopum, Gwangmaeg, Saessalbori, Nulichal, Heukbochal, Hogang, Ssagirang, Keunalbori-1, and Hangang, all developed by the National Institute of Crop and Food Science. The results indicated that the fermentation efficiency of the mash made from each barley cultivars were similar. This suggests that the N9 yeast demonstrates high fermentation capability regardless of the cultivar. Alcohol content ranged from 18.17% to 20.13%, while total acidity ranged from 0.35% to 0.63%. Volatile acid contents, which negatively impact quality of the mash, were higher in the mash made from malting barley cultivars such as Hopum and Gwangmaeg, measuring 864.67 and 883.33 mg/L, respectively. Reducing sugar content of these cultivars was also higher than those of other cultivars. The highest free sugar concentration was detected in mash made from Gwangmaeg. Lactic acid imparts a refreshing acidity, was identified as the primary organic acid. Overall, this study is expected to be useful for future cultivar selection by identifying the quality characteristics of mash for distilled soju.

P2-12

Effect of different mushroom powders on the quality characteristics of texturized vegetable protein (TVP)

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As concerns about environmental issues grow worldwide, plant-based meat is gaining attention as a sustainable food. In particular, texturized vegetable protein (TVP) replicates the structure of meat using plant-based protein, and its quality characteristics vary depending on the raw materials. Mushrooms, with their fibrous structure and high moisture absorption, offer advantages for texture enhancement. In this study, TVP was produced with the addition of 10% of seven different mushroom powders. The mushroom-added groups generally exhibited lower lightness (L) and yellowness (b) compared to the control. The moisture content of the EM group was similar to the control, but its water absorption capacity was significantly lower; overall, the mushroom groups had lower moisture content than the control. The solid leaching of the SM, PM, and EM groups was significantly lower than that of other groups. Hardness was significantly higher in all mushroom groups compared to the control. The OM and KM groups exhibited significantly higher springiness, and most mushroom-added groups showed improved chewiness. The cutting force was lower in the OM and PM groups than in the control. These results suggest that the physical properties of TVP vary depending on the type of mushroom used.

P2-13

Comparison and analysis of bioactivities between broccoli by-products and florets

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Broccoli (Brassica oleraces var. italica) is widely consumed due to its high nutritional value. It is particularly renowned for its rich contents of various bioactive compounds, including vitamin C, vitamin U, dietary fiber, and Sulforaphane, which are well-known for their anticancer, anti-inflammatory, and antioxidant effects. while the florets are primarily used for discarded as agricultural by-products, despite their reported excellent bioactive properties. This study aims to compare the bioactive properties of broccoli by-products with those of the florets, thereby suggesting their potential as food materials. For this study, broccoli was separated into florets, stems, and leaves, and each part was analyzed for its bioactive characteristics. In the DPPH radical scavenging activity, the stem exhibited the highest activity at 83.22%, while the leaves and florets showed 27.49% and 23.00%. Total polyphenol content was highest in the leaves (270.40 mg/100g), followed by florets (147.43 mg/100g) and stems (103.05 mg/100g). Similarly, total flavonoid content also showed the highest levels in the leaves (41.76 mg/100g), followed by florets (30.72 mg/100g) and stems (2.80 mg/100g). β-carotene content was significantly higher in the leaves(317.99 ug/100g), followed by stems (75.61 ug/100g) and florets (2.86 ug/100g). The pH values were measured as 6.15 for leaves, 6.84 for florets, and 7.41 for stems. In conclusion, the agricultural by-products of broccoli, specifically the leaves, demonstrated superior bioactive compound content compared to the florets and stems. Therefore, broccoli leaves are considered to have high potential for utilization as a functional food material.

P2-14

Characteristics of apple vinegar using single or combined liquid acetic acid bacteria starters

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This study investigated the quality characteristics of apple vinegar produced by treating with two isolated acetic acid bacteria strains(*Gluconobacter oxydans* 17, *Acetobacter pasteruianus* 21) either single or in combination. The vinegar was fermented at 30℃ for 6 weeks using 88% apple juice and 7% alcohol. As a result, the sample inoculated with *G. oxydans* 17 exhibited an increase in pH during the vinegar fermentation process, whereas the change in titratable acidity was negligible. The pH of vinegar samples treated with *A. pasteruianus* 21 and the combined A+G strains initially increased and then decreased, while the total acidity steadily increased. There were no significant differences in total polyphenol and antioxidant activity among the vinegar samples. The vinegar inoculated with *A. pasteruianus* 21 showed a continuous increase in lipase inhibition activity throughout the fermentation period, reaching the highest value. However, in the sensory evaluation, the vinegar treated with the combined strains received higher score. In summary, *G. oxydans* 17 exhibited slower acetic acid fermentation, and although the combined treatment produced superior aroma, it also caused turbidity. Therefore, it was concluded that using *A. pasteruianus* 21 alone would be preferable. This work was supported by the National Institute of Crop and Food Science, Rural Development Administration (RS-2022-RD010225).

P2-15

Quality characteristics of Korean traditional rice wines (Takju) by pretreatment

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This study aimed to evaluate the quality characteristics of Korean traditional rice wines (Takju) prepared using different rice pretreatments and rice varieties. These samples were produced based on combinations of rice type and fermentation starter: (A) 'Chuchung' rice flour with common nuruk(Soyulgok, Songhak Gokja, Kwangju, Korea), (B) 'Chuchung' rice flour with non-steamed nuruk, (C) rice flour cultivar('Baromi 2') with common nuruk, (D) 'Baromi 2' with non-steamed nuruk, and (E) steamed 'Baromi 2' with common nuruk. The pH and total acidity were analyzed to be in the ranges of 3.62 to 6.61 and 0.03% to 1.97%, respectively. On the 10th day of fermentation, alcohol content varied widely among samples, ranging from 2.6% to 16.0%, depending on the treatment. Total polyphenol contents had the highest values (201.84 and 203.05 mg/100mL) and tannin contents had the highest values (60.01 and 56.54 mg/100mL) in the C and D sample. DPPH radical scavenging activity was the highest in the C sample (74.78%). These results indicate that Korean traditional wines (Takju) added with rice flour cultivar by Pretreatment can be developed as functional tool for use in the industrial applications.

P2-16

Quality characteristics of apple vinegar using powdered *Acetobacter pasteruianus* 21

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This study aimed to evaluate the quality of apple vinegar supplemented with *Acetobacter pasteruianus* 21, which was finally isolated as a starter culture for farm-made fermented vinegar. The vinegar was fermented at 30℃ for 45 days using 88% apple juice and 7% alcohol. The powdered A. pasteruianus 21 was finally inoculated to achieve a concentration of 104 CFU/mL. Also, the changes in pH, total acidity, reducing sugar, color, total polyphenol contents, and antioxidant activity contents were investigated. During the fermentation period, the pH of the vinegar gradually decreased in a time-dependent manner, while the total acidity increased. Total polyphenol content and antioxidant activity slightly decreased over the fermentation periods, whereas the a-glucodiase and lipase inhibition activity significantly increased. The reducing sugar content repeatedly increased and decreased throughout the vinegar fermentation period. Organic acid analysis showed that the concentration of acetic acid increased sharply starting from day 27 of fermentation. Therefore, using A. pasteruianus 21 culture for vinegar production allows the manufacture of vinegar with over 4% total acidity within 34 days of fermentation and excellent lipase inhibition activity. This work was supported by the National Institute of Crop and Food Science, Rural Development Administration (RS-2022-RD010225).

P2-17

Quality characteristics of scone prepared by addition of Korean traditional wines lees

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In this study, we attempted to compare the quality characteristics of scone prepared with the addition of different quantities of Korean traditional wines lees. The reducing sugar contents increased with the addition of increasing quantities of lees, whereas pH decreased. Total polyphenol and tannin contents had the highest values(94.27 mg/100 mL and 27.61 mg% respectively) in the E treatment which is the scone of 9% lees. The ABTS and DPPH radical scavenging activity of the samples were 35.03~43.73% and 21.10~37.08% respectively. In the sensory evaluation, the scone containing 5% Korean traditional wines lees received the highest overall acceptability score among all samples. This study demonstrates the potential of upcycling Korean traditional wines lees into bakery products, contributing to sustainable food production and waste reduction.

P2-18

Quality characteristics of kimchi fermented with various lactic acid bacteria as liquid starters

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The objective of this study was to evaluate the functional properties of three lactic acid bacteria (*Lactobacillus plantarum, L. curvatus and L. brevis*) in cabbage kimchi. The quality characteristics and physicochemical properties of kimchi fermented with different liquid starter cultures were investigated. During the fermentation period, the pH gradually decreased in a time-dependent manner, while the total acidity increased. The total cell counts increased from 5.63~6.93 to 7.66~8.87 log CFU/g over the fermentation period and a similar pattern was observed in the total lactic acid bacteria counts. Throughout the fermentation period, the inoculated samples exhibited bacterial counts that were 10 to 20 times higher than those of the control. There were no significant differences in mold counts among the samples. The total polyphenol content and antioxidant activity showed minimal variation during fermentation, whereas sample B (*L. plantarum*) was significantly higher levels than the other samples. The concentrations of organic acids were generally higher in the inoculated samples compared to the control. In the sensory evaluation, kimchi with *L. plantarum* starters received higher overall acceptability scores than those of other samples. In conclusion, *L. plantarum* may serve as an effective functional starter for the production of lactic acid-fermented foods. This work was supported by the National Institute of Crop and Food Science, Rural Development Administration (RS-2022-RD010225).

P2-19

Quality characteristics of kimchi fermented with various lactic acid bacteria as powder starters

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The objective of this study was to evaluate the functional properties of three lactic acid bacteria (Lactobacillus plantarum, L. curvatus and L. brevis) in cabbage kimchi. The quality characteristics and physicochemical properties of kimchi fermented with different power starter cultures were investigated. During the fermentation period, the pH gradually decreased in a time-dependent manner, while the total acidity increased. The total cell counts slightly decreased from 7.15~7.45 to 5.58~7.02 log CFU/g over the fermentation period whereas the total lactic acid bacteria counts slightly increased. The total polyphenol content and antioxidant activity fluctuated throughout the fermentation period whereas the lipase inhibition activity dramatically increased. The concentration of organic acids increased as fermentation progressed, with the control sample showing the highest levels. There were no significant differences among the samples in the sensory evaluation. In conclusion, there were no differences in the kimchi fermentation process over time depending on the addition of lactic acid bacteria powder. This work was supported by the National Institute of Crop and Food Science, Rural Development Administration (RS-2022-RD010225).

P2-20

Physiological activities of distilled liquor by solid-state fermentation kees by drying methods

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The objective of this study was to investigate physiological activities of distilled liquor by solid-state fermentation lees by drying methods (hot air drying (50 and 70°C), cold air drying, freeze drying). The pH values of the dried lees samples ranged from 3.59 to 3.81, while total acidity was between 0.15% and 0.50%. Among the treatments, the hot-air dried samples (70°C) showed the highest b values (yellowness) values (53.65). The total polyphenol and tannin contents were highest in hot-air dried (70°C) samples at 646.86 mg/100mL and 274.81 mg%. The ABTS and DPPH radical scavenging activity showed the highest value in hot-air drying (70°C) at 68.58 and 54.84% respectively. This study contributes to understanding the physicochemical and bioactive changes in solid-state fermented lees under different drying conditions, while also presenting a sustainable approach to upcycling traditional fermentation by-products by enhancing their functional value through appropriate drying methods.

P2-21

Comparison of physical and functional properties of soy protein from domestic soybean cultivars

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This study investigated the properties of soy protein extracted from various domestic soybean cultivars. The cultivars examined were Daewon (DW), Miso (MS), Seonpung (SP), Pungsannamul (PS), Daechan (DC), Daedan (DD), and Seonyu 2 (SU2). The highest protein recovery yield was observed in DD (43.3%), followed by MS (36.7%), PS (34.7%), SU2 (31.4%), DW (31.3%), SP (30.5%), and DC (29.9%). DD, known for its high crude protein content in raw soybeans, also exhibited the highest crude protein content (66.1%). No significant differences were found in water absorption capacity and oil absorption capacity among the cultivars. The emulsifying capacity and emulsion stability were highest in PS, at 4.89 m^2/g and 25.07 min, respectively. The foaming capacity was highest in MS, while its foam stability was the lowest. Conversely, SU2 showed the lowest foaming capacity but the highest foam stability. SDS-PAGE analysis revealed no significant differences among cultivars, although no band corresponding to lipoxygenase (90-102 kDa) was observed in MS. These results suggest that the functional properties of soy protein vary depending on domestic soybean cultivars, providing basic data for developing protein-based ingredients using domestic soybeans.

P2-22

Effect of shiitake mushroom powder addition as a gluten substitute on the quality of textured vegetable protein (TVP)

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The demand for gluten substitutes is increasing due to health-conscious trends and digestive wellness. This study was evaluated the effect of varying levels of shiitake mushroom (Lentinula edodes) powder (SMP) as a gluten replacement on the quality of texturized vegetable protein (TVP). The base mixture consisted of 50% defatted soybean flour, 30% gluten, and 20% corn starch, with gluten:SMP ratios of 20:10, 10:20, and 0:30 (%). Extrusion was carried out using a twin-screw extruder with a cooling die at 150°C, 250 rpm screw speed, and 40 rpm water injection rate. As a result of the TVP quality analysis, the 10% SMP added group exhibited superior elasticity and fibrous structure in appearance, along with higher hardness, chewiness and cutting strength. Fibrous degree was highest in the 20% SMP added group, though not significant. All SMP -added groups showed lower turbidity and increased solid dissolution compared to the control. Additionally, increasing SMP content led to decreased moisture and enhanced water absorption capacity, attributed to the mushroom fiber content. These results suggest that the addition of 10% SMP is an effective strategy for gluten replacement and may be beneficial in the development of gluten-reduced products.

P2-23

Milling characteristics of wheat using an industrial milling system

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Wheat is classified into varieties according to its intended use, and is milled into flour and distributed and consumed as various products such as bread, noodles, and confectionery. Domestic wheat is limited in the variety available, and its quality is lower than that of imported wheat, so it is not consumed continuously. Domestic wheat can be mixed with rice in the form of mixed grains to promote consumption. This study examined the milling characteristics using an industrial-scale milling system to cook domestic wheat and consume it together with rice. The weight of the thousand, whiteness, protein, and color were measured while the rice was passed 16 times through a friction-type rice milling machine used for rice milling of the Geum-gang variety. The milling degree was calculated using the thousand grain weight, and a polynomial experimental model (y = 76.9014-0.6185x) of the whiteness change according to the milling degree was developed, and the coefficient of determination was 0.9952, which was satisfactory. As the milling degree increased, the thousand grain weight decreased, while the whiteness tended to increase. In addition, the moisture content and protein decreased as the milling degree increased. This work was carried out with the support of "Research Program for Agriculture Science and Technology Development (Project No. RS-2025-02263107)" Rural Development Administration, Republic of Korea.

P2-24

Milling characteristics of wheat using an industrial milling system

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This study aimed to evaluate the changes in quality characteristics of 'Chung rang' wine, made from grapes cultivated in Okcheon, Chungbuk, Korea, during oak chip aging. After fermentation and racking at 10 °C for 4 weeks, the wine (pH 4.12, 8 °Brix, 0.50% total acidity, 0.02% volatile acidity, 10.5% alcohol) was aged with 0.5% (w/v) medium-toasted oak chips from the United States, France, and South Korea. During the 3-month aging period, pH, total acidity, alcohol content, color parameters (L, a*, b*, Hue, Color Intensity), total polyphenols, tannins, anthocyanins, and antioxidant activity (ABTS, DPPH) were analyzed monthly. Total acidity decreased to 0.45-0.47 across all samples, and pH dropped to 3.90 in the control and 3.70-3.76 in oak-treated wines. Lightness (L) and redness (a*) decreased, while yellowness (b*), Hue, and Color Intensity increased. Total polyphenol and anthocyanin contents generally declined, but tannin levels increased in oak-treated wines. Anthocyanin concentrations in the treated groups (334.09-347.28 mg/L) were higher than the control (274.89 mg/L). Sensory evaluation showed reduced color preference but improved aroma, flavor, and overall acceptability, particularly in wines aged with French oak chips, which showed a distinct oak character.

P2-25

Effects of aging temperature on the color and aroma compounds of Cheongsoo fortified wine

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This study was conducted to analyze the changes in color and aroma compounds of Cheongsoo fortified wine according to aging temperature. The fermentation was initiated at 26 °Brix, and stopped at 12 °Brix. The aging was conducted at room temperature, 30℃, and 40℃ for four months. The aroma compounds were analyzed after 3 months of aging. In the color analysis of Cheongsoo fortified wine according to aging temperature, lightness (L) and redness (a*) showed little change, whereas yellowness (b*) exhibited noticeable variation. At room temperature, there was no significant change, whereas at 30℃, it increased from 10.12 to 25.39 after four months. A more rapid increase was observed at 40℃, with values rising from 10.12 to 39.25 after one month. The hue value also tended to increase as aging progressed, which is presumed to be due to oxidation occurring over the extended aging period. Changes in the aroma compounds of Cheongsoo fortified wine showed that higher aging temperatures led to lower alcohol content, while acetate and ester tended to increase as the aging temperature rose. These study results are expected to have contributed to diversification of Cheongsoo wine in farm wineries.

P2-26

Effects of aging temperature on the color and aroma compounds of Campbell Early fortified wine

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This study was conducted to analyze the changes in color and aroma compounds of Campbell Early fortified wine according to aging temperature. The fermentation was initiated at 26 °Brix, and stopped at 12 °Brix. The aging was conducted at room temperature, 30℃, and 40℃ for four months. The aroma compounds were analyzed after 3 months of aging. The color characteristics of Campbell Early fortified wine according to aging temperature showed that lightness (L*) and yellowness (b*) increased with longer aging periods, while redness (a*) tended to decrease over time. The extent of these changes was more pronounced at elevated temperatures. Additionally, the hue value tended to increase with prolonged aging, with greater variations observed at higher aging temperatures. Changes in the aroma compounds of Campbell fortified wine showed that alcohol decreased and acetate tended to increase with higher aging temperatures. These study results are expected to have contributed to diversification of Campbell Early wine in farm wineries.

P2-27

스파클링 와인용 효모 *Saccharomyces cerevisiae* HK22의 온도 및 pH 조건에 따른 생육 특성 분석

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스파클링 와인의 품질 유지를 위해서는 탄산가스 생성 과정인 2차 발효 시 탄산압을 안정적으로 생성하고, 병입 후 후발효 등으로 인한 품질 저하를 방지할 수 있도록 효모의 특성을 파악하는 것이 중요하다. 이에 따라 본 연구에서는 스파클링 와인 제조에 사용되는 와인연구소 보유 균주 *Saccharomyces cerevisiae* HK22의 생육 특성을 조사하였다. HK22를 포함한 와인연구소 보유 균주 5종(*S. cerevisiaae* ES22, EJ18, EJ30, HK32)을 YPD broth에서 배양한 후 , 100~104 수준으로 희석하여 YPD agar에 도말하고, 생육을 관찰하였다. 온도 조건을 5~45℃로 달리하여 조사한 결과, 5개 균주 모두 10℃ 이하 및 42.5℃ 이상의 온도에서는 생육하지 못하였으며 25~35℃ 사이에서 가장 원활하게 생장하였다. pH 조건에 따른 생육 특성을 조사한 결과 pH 4~7사이에서는 모든 균주가 생육이 가능하였으며 pH 9 이상의 고염기 배지에서는 자라지 않았다. 보유 균주 5종의 알코올 생성능을 조사한 결과, 48시간 진탕배양했을 경우 알코올 함량을 11.1~11.9%로 생성하였다. 이와 같은 균주의 생육 특성 조사는 향후 스파클링 와인 양조와 품질 유지를 위한 기초자료로 활용될 수 있을 것이다.

P2-28

Assessment of extraction solvent and ultrasonication for *Protaetia brevitarsis* larvae protein

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Protaetia brevitarsis larvae are insects that are considered to be edible in South Korea, known for their high protein content and functional properties. During protein extraction, the choice of extraction solvent and additional processes can affect the yield, composition, and structure of extracted protein. Thus, this study compared the *Protaetia brevitarsis* larvae proteins (PBP) which are differently extracted for 2 h using water or salt solution, with or without ultrasonication. Extraction yield and protein solubility at pH 7 were the highest in the PBP extracted with water and ultrasonication (W-US). The particle size of proteins was increased by ultrasonication ($p<0.05$), while surface hydrophobicity was the highest in the PBP extracted with salt solution and ultrasonication (S-US). W-US showed the lowest surface hydrophobicity. The foaming properties and emulsion stability were superior in S-US, and W-US showed no difference with the water-extracted PBP without ultrasonication. However, the emulsifying capacity of S-US was lower than other PBPs, which may result from the too high foaming capacity. Therefore, PBP can be more easily extracted using water and ultrasonication, but with salt solution and ultrasonication, PBP had the higher functional properties.

P2-29

Stage-specific alterations in physicochemical properties and volatile compounds of Laver (*Pyropia* spp.) during industrial processing

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Laver (*Pyropia* spp.) is an increasingly important marine resource due to rising global demand. Despite its commercial significance, there is a lack of comprehensive scientific investigations into its processing characteristics. This study systematically evaluated changes in physicochemical properties and volatile compound profiles throughout the four principal stages of industrial laver processing. Proximate analysis demonstrated that both carbohydrate and crude protein contents increased as a result of dehydration during processing. Quantification of free amino acids revealed substantial elevations in glutamic acid and alanine, likely reflecting proteolytic activity and associated metabolic pathways. Orthogonal projections to latent structures discriminant analysis (OPLS-DA) enabled clear differentiation of processing stages based on amino acid composition. Volatile compound analysis indicated that early processing stages were characterized by higher levels of acetaldehyde and furans, imparting ethereal aroma notes, whereas later stages were marked by increased concentrations of pungent odorants such as propanoic acid and cis-3-hexenol. These findings demonstrate that profiling of amino acids and volatile compounds provides robust indicators for quality control and process monitoring in industrial seaweed manufacturing. This research was supported by the Korean Institute of Marine Science & Technology Promotion (KIMST), funded by the Ministry of Oceans and Fisheries (20210695).

P2-30

Optimization of the alcohol removal process based on reduced pressure concentration for the production of non-alcoholic white wine and application of the salting-out effect

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With rising interest in healthy drinking habits, demand for non- and low-alcohol wine is increasing, especially among consumers seeking to enjoy wine's aroma and flavor while reducing alcohol intake. However, conventional dealcoholization processes often cause the loss of volatile aroma compounds, diminishing sensory quality. This study aimed to optimize a vacuum distillation process for producing non-alcoholic white wine by applying the salting-out effect to remove ethanol efficiently while minimizing aroma loss. To evaluate feasibility, vacuum distillation without salt was performed, and conditions were optimized using response surface methodology (RSM). Temperature was set at 40, 50, and 60°C (52, 91, 140 Torr), and time at 60, 120, and 180 minutes. Results showed time had a greater effect on alcohol content and yield than temperature. Optimal conditions were 50°C and 142 minutes, yielding 0.99% alcohol and 83.99% product recovery. Sodium and potassium citrate were also tested. Potassium citrate showed better ethanol removal but caused more aroma loss. Sodium citrate showed lower removal efficiency but preserved aroma compounds better. This study suggests that combining vacuum distillation with salting-out can enhance production efficiency and minimize quality degradation in non-alcoholic white wine manufacturing.

P2-31

Evaluation of antioxidant activity and quality characteristics of jellies containing defatted *Gryllus bimaculatus*

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As interest in edible insects as sustainable protein sources increases, their use in diverse food products is gaining attention. This study aimed to evaluate the potential of incorporating defatted *Gryllus bimaculatus* into jelly as a protein-enriched functional food. The insects were defatted using hexane, and jellies were prepared with varying levels of insect powder. The resulting samples were analyzed for physicochemical characteristics and antioxidant activity. Jellies with added *Gryllus bimaculatus* showed increases in fat, moisture, ash, and notably protein content. Essential amino acid levels also rose, reflecting the insect's nutritional composition. As more powder was added, the pH of the jelly increased. Color values showed decreased lightness (L*) and increased redness (a*) and yellowness (b*). In terms of texture, hardness and cohesiveness declined with increased insect content. Additionally, the total polyphenol content significantly increased, enhancing antioxidant capacity as confirmed by DPPH and ABTS radical scavenging activity. Overall, these results suggest that defatted *Gryllus bimaculatus* can be used to enhance both the nutritional profile and antioxidant functionality of jelly, supporting its application in the development of insect-based functional foods.

P2-32

전처리 무 첨가에 따른 쌀 누룽지의 이화학적 품질 특성

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무를 전처리한 생무 건조 분말, 스팀 열처리 무 건조 분말, 초미세 찹쌀가루를 코팅하여 제조한 무 건조부각 분말, 착즙 무즙액 등 4가지 재료를 각각 첨가(분말 6%, 즙액 60%)하여 스낵형의 찹쌀(100%), 혼합쌀(찹쌀 20%, 멥쌀 80%) 및 멥쌀(100%) 누룽지 등 총 15종의 쌀 누룽지(GRN~NGRNJ)를 제조하였다. 찹쌀(glutinous rice, GR) 누룽지의 경우 무 무첨가 누룽지(GRN), 건조처리 누룽지(GRND), 스팀처리 누룽지(GRNS), 코팅처리 누룽지(GRNC) 및 무즙액 첨가 누룽지(GRNJ)로 가공 후 기호성과 밀접한 맛과 향을 전자혀, 전자코로 기기 분석하였다. 기타 색도, 경도, 총 고형분, pH, 총 폴리페놀, 총 플라보노이드 등을 분석하였다. 맛 성분에서 쌀 종류별 대조군(GRN, MRN, NGRN)에서 뚜렷한 차이가 있었으며, 혼합쌀(MR)로 제조한 MRN, MRND, MRNS, MRNC 및 MRNJ 누룽지는 멥쌀(NGR) 누룽지에서 부족한 감칠맛과 단맛 등이 강했다. 향기 성분에서 쌀누룽지의 대조군간 뚜렷한 차이가 없었으나, 전처리무를 첨가한 찹쌀 누룽지에서 처리군간 뚜렷한 차이를 나타내었다. 색도 중 대조군 3종의 백색도는 69.93±3.47~59.12±4.43으로 찹쌀 누룽지의 명도가 가장 높았다. 플라보노이드 함량은 NGRNJ가 54.43±1.70 mgNE/mL로 가장 높았다.

P2-33

Comparison of quality characteristics between papaya (*Carica papaya* L.) flesh and peel

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Among subtropical fruits cultivated in Korea, papaya (Carica papaya L.) has the highest cultivation rate in Gyeongnam Province, accounting for 71%, and is emerging as a promising income-generating crop. To address market limitations and price instability due to expanded cultivation, this study analyzed the proximate composition and quality characteristics of the flesh and peel of four vegetable-type and three fruit-type papaya cultivars. The results showed that the peel contained higher levels of crude protein and insoluble dietary fiber (IDF) than in the flesh, while fructose and glucose were more abundant in the flesh. Sucrose was not detected in any sample. Vegetable-type papayas had higher moisture content, and crude protein content was highest in the Solo cultivar, followed by Holland. Among fruit-type papayas, the highest crude protein content in the peel followed the order: Sweettan 〉 Solo 〉 Holland, while in the flesh, it followed Solo 〉 Sweettan 〉 Holland. Ash content was higher in fruit-type papayas, whereas IDF and total dietary fiber (TDF) were predominantly higher in vegetable-type papayas, with Solo exhibiting higher levels than Holland. These findings provide essential baseline data for the development and industrial application of processed papaya products.

P2-34

무(*Raphanus sativus* L.) 농축액의 가공 방법에 따른 맛 성분 변화

정아영, 김표현, 지수현, 이선경, 이유석, 김주현, 이소진, 고숙주
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무는 동양권에서 주로 김치류와 절임류 형태로 소비되고 있는 식재료이다. 무에 함유된 식이황 화합물, 아미노산, 유리당 등은 매운맛, 쓴맛, 감칠맛, 단맛 등의 고유한 풍미를 형성하며 다양한 요리에 활용될 수 있다. 본 연구에서는 무 농축액의 가공방법에 따른 주요 맛 성분을 비교하고 조미소재로서의 활용 가능성을 평가하였다. 무 농축액은 세척, 절단, 전처리, 여과, 농축 단계를 거쳐 제조되었다. 이때 농축 전처리 방법에 따라 처리구를 마쇄 및 압착(GP), 증자 및 압착(SP), 열풍건조 및 열수추출(DE)로 설정하였다. 무를 증자 또는 건조 처리 시 쓴맛, 시원한맛과 관련된 식이황화합물인 glucoraphasatin, glucoraphenin 함량이 크게 증가하였다. 한편 감칠맛, 단맛과 관련된 성분인 총아미노산 및 glucose, fructose 함량은 소폭 감소하였고, 이때 SP보다 DE에서 더 크게 감소하였다. SP에 포함된 38종의 유리아미노산 분석 결과 감칠맛, 단맛과 관련된 glutamic acid, aspartic acid의 함량이 높은 비율로 측정되었다. 따라서 무에 증자 처리하는 가공 방식은 주요 맛 성분 함량의 향상 또는 유지에 기여할 수 있으며, 조미소재로서 활용 가능성을 높여줄 수 있을 것으로 사료된다.

P2-35

Evaluation of quality attributes of roasted tea utilizing tea processing by-products and pruning residues

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The objective of this study was to ascertain the most effective roasting conditions for the production of roasted tea by leveraging underutilized resources, including processing by-products and whole products from the tea industry. Additionally, the study sought to examine the alterations in critical components prior to and following the roasting process. The experimental results demonstrated that the optimal conditions for processing by-products and whole products were as follows: a heating time of 15 minutes at 250°C, followed by a heating time of 20 minutes at 200°C, and concluding with a heating time of 25 minutes at 250°C. A compositional analysis revealed a decline in total polyphenol content by 12%, a substantial decrease in total catechin content by 53%, and a remarkable increase in gallic acid content by 8.6 times following the roasting process. The total polyphenol content exhibited a decline of 4.7%, while the total catechin content experienced a significant decrease of 34%. Concurrently, the level of gallic acid escalated by 3.1 times. These alterations are hypothesized to be attributable to deterioration reactions that transpire during the roasting process, thereby underscoring the feasibility of repurposing discarded resources as food ingredients. This research was supported by the Rural Development Administration (No. RS-2025-10202968).

P2-36

식품원료 갈색거저리(*Tenebrio molitor*), 쌍별귀뚜라미(*Gryllus bimaculatus*) 건조방법과 가수분해 처리에 따른 가수분해율 및 이취 특성

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식품원료로 등재된 식용곤충은 현재 10종으로 고단백 및 기능성 식품 소재로서의 개발 가능성이 높게 평가되고 있다. 그러나 곤충 특유의 이취와 소비자들의 거부감으로 인해 제품화에는 여전히 어려움이 존재한다. 특히 갈색거저리(*Tenebrio molitor*)와 쌍별귀뚜라미(*Gryllus bimaculatus*)는 고단백, 고영양의 곤충 자원으로 주목받고 있으며, 다양한 식품에의 응용 가능성이 제시되고 있다. 본 연구에서는 대표적인 식용곤충인 갈색거저리와 쌍별귀뚜라미를 대상으로 다양한 건조 및 가수분해 전처리 방법이 가수분해율과 이취에 미치는 영향을 분석하였다. 효소 복합처리 Alcalase+Neutrase를 처리하여 시험을 수행한 결과 갈색거저리 볶음(5% 처리), 튀김(5% 처리), 마이크로웨이브(3% 처리), 쌍별귀뚜라미 볶음(5% 처리), 튀김(3% 처리), 마이크로웨이브(3% 처리)에서 가수분해율이 높은 것으로 나타났다. 또한 이취 특성 분석을 위해 황화합물 함량을 측정한 결과 갈색거저리는 볶음(▽21%), 튀김(▽62%), 마이크로웨이브(▽54%), 가수분해 5% 볶음(▽79%), 가수분해 5% 튀김(▽94%), 가수분해 3% 마이크로웨이브(▽67%) 감소하였으며 쌍별귀뚜라미는 볶음(▽22%), 가수분해 5% 볶음(▽39%), 가수분해 3% 튀김(▽24%) 감소, 튀김(△654%), 마이크로웨이브(△970%), 가수분해 3% 마이크로웨이브(△300%) 증가하는 것으로 조사되었다.

P2-37

갈색거저리(*Tenebrio molitor*) 기름의 토코페롤 함량 및 항산화 활성 효과

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갈색거저리(*Tenebrio molitor*)는 최근 단백질 및 기능성 소재로 주목받고 있으며, 주로 분말 형태로 가공되어 식품 및 사료 산업에 활용되고 있다. 이러한 분말 제조 공정 중 발생하는 압착 착유 오일은 현재까지 대부분 활용되지 못한 채 부산물로 처리되고 있는 실정이다. 그러나 곤충 오일은 불포화지방산, 토코페롤 등 유용한 생리활성 성분을 함유할 가능성이 높아, 이의 품질특성 및 기능성분을 규명하고, 그 활용 가치를 평가하고자 하였다. 갈색거저리 오일의 총 토코페롤 함량은 442 mg/100 g으로 시판 올리브유에 비해 약 4.7배 높게 나타났으며, 특히 δ-tocopherol의 함량이 가장 높게 측정되었다. 항산화 활성 효과는 총 플라보노이드, DPPH assay, hydroxyl radical-scavenging, Fe2+ 킬레이팅 활성비교에서 시판 올리브유 보다 높은 항산화 활성을 나타내는 것으로 확인되었다.

P2-38

갈색거저리(*Tenebrio molitor*) 유충 탈지분말 첨가 약과 품질특성

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최근 식품 산업에서는 지속 가능한 단백질 자원의 확보와 기능성 식품 개발에 대한 관심이 증가하고 있다. 그 중 갈색거저리(Tenebrio molitor) 유충은 고단백, 고영양의 곤충 자원으로 주목받고 있으며, 다양한 식품에의 응용 가능성이 제시되고 있다. 본 연구에서는 전통 한과인 약과에 갈색거저리 유충의 탈지분말을 첨가하여 이화학적, 관능적 품질 특성에 미치는 영향을 평가하였다. 일반성분 분석결과 조단백질 함량은 최대 17.5%(기존 약과 대비 2.5배)를 나타냈으며, 그 외 조지방 39.0%, 수분 3.71%, 회분 1.03%으로 단백질을 제외한 나머지 항목들은 대조구와 비교하여 큰 차이가 없었다. 색도는 갈색거저리 함량이 높아질수록 L값은 낮게 측정되어 어두운 색을 나타냈으며, a값은 30% 첨가구에서 11.4로 가장 높게 측정되었고, b값은 10% 첨가구에서 30.9로 가장 높게 측정되었다. 물성은 약과의 점도있는 특성을 고려하여 물리량(g.sec)을 측정한 결과 20~30% 첨가구에서 가장 높은 값을 나타냈다. 관능 특성은 10% 첨가 했을 때 가장 우수한 것으로 나타났다.

P2-39

먹이원 조성에 따른 흰점박이꽃무지(*Protaetia brevitarsis*)의 영양 성분 분석

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흰점박이꽃무지 먹이원은 참나무톱밥에 미생물과 첨가물을 혼합하여 부숙 후 사용하기 때문에 농가별로 상이하다. 본연구는 식용 곤충종인 흰점박이꽃무지의 선도 사육농가 5개소를 대상으로 먹이원과 수확 유충의 영양성분 함량을 비교 분석하였다. 일반성분의 경우 건량 기준으로 먹이원의 조단백질은 농가간에 6.8% 차이가 있었으나 유충에서는 2.5% 차이를 보여 먹이원에 포함된 조단백질 함량이 유충 발육에 필요한 단백질 형성에 크게 영향을 미치지 않은 것으로 보인다. 조지방은 강진농가에서 21.4%로 타 농가에 비해 10.4~13.7% 차이를 보였는데, 그 이유는 사육 온도가 2령까지는 30℃, 3령 25℃, 종령 유충 20℃로 변온 사육을 하며 사육기간이 길어지고 이 시기 지방이 축적된 것으로 사료된다. 무기물은 무안농가에서 칼슘 함량이 유충과 배지에서 높게 나타났는데 이는 먹이원 제조시 버섯 폐배지를 넣어 만드는 농가로 버섯배지 제조 시 첨가되는 석회성분이 영향을 준 것으로 사료된다.

P2-40

유자를 활용한 귀리 식물성단백질 추출조건 비교

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본 연구는 유자를 활용한 식물성 단백질 음료 개발을 목적으로, 귀리에서의 단백질 추출 및 침전 조건이 단백질 함량과 수율에 미치는 영향을 평가하였다. 그 결과, 단백질 침전 처리에서 YCA가 CA에 비해 단백질 함량은 약 21%, 조단백 함량은 7~16% 높게 나타났으며, 침지 하지 않은 NS 조건에서 단백질 함량은 2%, 조단백 함량은 10% 더 높게 나타났다. 이는 침지를 생략하고 YCA를 활용한 침전이 더 효과적인 단백질 회수 방법임을 시사한다. 효소 처리 조건에서는 protease를 포함하지 않은 EnzymeⅡ 처리군에서 단백질 함량이 가장 높았으며, 추출 수율은 EnzymeⅠ〉EnzymeⅡ〉EnzymeⅢ 순으로 나타났다. 알칼리 추출 및 산 침전 조건별 단백질 회수율 분석 결과, 추출 pH 모두 pH 4-6 조건에서 침전할 때 높은 수율을 보였으며, 특히 pH 12에서 추출한 후 pH 6에서 침전한 처리군에서 단백질 및 조단백 함량이 가장 높았다. 따라서, 유자를 활용한 식물성 단백질 음료 개발을 위한 귀리 단백질 추출에는 원곡을 침지하지 않고 pH 12에서 알칼리 추출 후 유자혼합산(YCA)으로 pH 6에서 침전 처리 조건이 가장 적합한 것으로 판단된다.

P2-41

토란 줄기, 어미토란의 아린맛 저감을 위한 처리조건 비교

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토란(*Colocasia esculenta*)은 필수아미노산, 무기질이 풍부하고 갈락탄, 뮤신 성분을 함유하여 혈압조절, 소화촉진, 면역증진 등 효능이 있으나 옥살산을 함유하고 있어 아린맛으로 인해 활용에 제약이 있다. 따라서, 본 연구는 알토란 못지 않게 칼륨, 아연의 훌륭한 공급원이며 비타민 등 영양·기능 성분 및 효능이 우수한 토란 줄기와 어미토란의 활용도를 높이기 위해 아린맛을 줄이는 처리 조건을 검토하였다. 그 결과, 소금물 침지 처리는 어미토란보다 줄기에서 효과적이었으며 시간에 대한 감소 효과는 어미토란에서 더 우수하였다. 반면, 데치기 처리는 줄기보다 어미토란에서 효과적이었으며, 데치기 시간에 따른 아린맛 성분이 유의적으로 감소하였다. 또한 잠재적인 아린맛을 줄 수 있는 칼슘과 항고혈압과 면역력에 도움을 줄 수 있는 칼륨, 아연 함량을 동일한 처리조건에서 검토하였다. 칼슘, 칼륨은 데치기 처리시 그 함량이 감소하였지만 칼륨의 경우 성인 하루 섭취권장량을 충족시킬 수 있는 함량이었으며, 반면 아연은 증가하는 경향을 보였다. 최종적으로 원물 대비 줄기는 28%, 어미토란은 62%의 아린맛을 줄이면서 줄기의 칼슘은 49% 줄일 수 있는 1% 소금물에 25시간 침지 후 10분간 데치기하는 것이 아린맛을 줄이는데 가장 효과적일 것으로 판단되었다.

P2-42

홍화순 데침 및 건조 조건에 따른 홍화순 분말의 품질특성

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홍화(*Safflower, Carthamus tincotorious L.*)는 국화과에 속하는 일년생 초목으로 잇꽃이라고 불리며, 주로 민간 및 한방에서 골질환 치료제로 널리 사용되는 홍화씨를 수확하기 위해 재배되고 있다. 홍화순은 홍화씨를 재배할 때 얻어지는 부산물로 선행연구를 통하여 홍화순 또한 골질환 개선 및 예방 효과가 있음이 밝혀져 이를 다양한 가공제품에 활용하고자 분말 제조 조건을 확립하였다. 홍화순의 풋내와 미생물적 오염을 줄이기 위하여 데침 처리를 실시하여 본 결과 1분 데침 처리 시 녹색도($-a^*$), 당도 및 관능적 기호도가 가장 우수하였고, 파골세포분화억제 활성을 갖는 quercetin-7-*O*-glucoside 및 luteolin-7-*O*-glucoside의 함량 또한 가장 높았다. 홍화순을 다양한 건조 조건으로 처리하여 본 결과 고온의 열풍건조보다 40℃ 열풍건조 시 녹색도($-a^*$) 및 당도가 우수하고, quercetin-7-*O*-glucoside 및 luteolin-7-*O*-glucoside의 함량 또한 동결건조와 유사하여 경제성을 고려하였을 때 40℃ 열풍건조가 적합한 것으로 판단되었다. 따라서 홍화순을 이용한 분말 제조 공정은 세척한 홍화순을 1분간 데침 처리하고, 40℃에서 열풍건조 후 분쇄하는 것으로 확립하였다.

P2-43

홍화순 수확시기별 유용성분 함량 변화

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홍화(Safflower, Carthamus tincotorious L.)는 국화과에 속하는 일년생 초목으로 한국, 중국, 일본 등에서 꽃과 씨가 식용 및 약용으로 사용되고 있으며, 홍화의 80% 이상을 차지하는 잎과 줄기는 부산물로 대부분 버려지고 있다. 하지만, 최근 선행연구에서 홍화순에 포함된 quercetin 및 luteolin 유도체가 파골세포 분화와 골 흡수를 효과적으로 억제하여 골질환의 개선이나 예방 효과가 있음이 보고됨에 따라 본 연구에서는 재배방법 및 수확시기에 따른 quercetin-7-*O*-glucoside 및 luteolin-7-*O*-glucoside 함량 변화를 확인하고자 하였다. 가을 파종-봄 수확 홍화순을 3월 10일부터 1주 간격으로 수확하여 분석한 결과 경화가 시작되는 4월 4주에 quercetin-7-*O*-glucoside 4.7 mg/g, luteolin-7-*O*-glucoside 17.6 mg/g으로 그 함량이 가장 높았고, 봄 파종-여름 수확 홍화순에서도 경화가 시작되는 6월 1주에 각각 8.1 mg/g, 16.9 mg/g으로 최대치를 보였다. 가을 파종-봄 수확 보다 봄 파종-여름 수확 홍화순에서 두 성분의 함량은 조금 더 높게 나타났다.

P2-44

고구마 잎·줄기 추출물의 기능적 특성

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고구마(Sweet potato, Ipomoea batatas)는 뿌리, 줄기, 잎이 모두 식용이 가능하며 단위면적당 생산량이 높은 작물로 전남이 전국 최대 생산지이다. 고구마의 지상부인 잎과 줄기는 주로 뿌리를 목적으로 재배되는 과정에서 일부분만 이용되고 있으며, 일반적으로 김치를 담거나 삶고 건조시켜 나물로 먹지만 그 이용도가 미흡하여 많이 버려지고 있는 실정이다. 따라서 다량 폐기되고 있는 고구마 잎·줄기 이용 활성화를 위하여 고구마 잎·줄기에 존재하는 유용성분의 최적 추출방법을 확립하고자 하였다. 음료로 활용하기 위한 열수 추출 시, 100℃에서 추출하는 것이 총 폴리페놀 함량 726±2 mg/100 g으로 가장 많았고, 항산화 활성 또한 1,001±2 mg/100 g Vit. C eq.으로 가장 높게 나타났다. 화장품에 활용하기 위하여 추출 온도 조건과 용매 비율을 달리하여 본 결과, 강력한 항산화 화합물로 알려진 chlorogenic acid 및 ioschlorogenic acid 3종의 합이 1,665 mg/100 g으로 가장 많고, 항산화 활성 또한 1,770±4 mg/100 g Vit. C eq.으로 높게 나타난 50℃에서 50% 주정으로 추출하는 것이 가장 적합한 것으로 판단되었다.

P2-45

장립종 쌀 품종의 이화학 및 취반특성

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기후변화, 국내 밥쌀용 쌀 생산과잉 해결, 수출시장 개척 등을 위해 국내에서도 장립종 쌀 품종을 지속해서 개발하고 있다. 본 연구에서는 국내에서 육성한 장립종 쌀 품종(IPS, 프로자스민, 아미면)과 태국쌀(품종 혼합), 새청무의 이화학 및 취반특성을 조사하였다. 쌀의 장폭비는 태국쌀이 3.73으로 가장 높았고, IPS, 아미면, 프로자스민, 새청무 순이었으며, 새청무는 1.75로 나타났다. 단백질 함량은 국내 육성 품종이 모두 9%이상으로 조사되었고, 태국쌀과 새청무는 각각 6.61%, 6.52%로 상대적으로 낮았다. 총 당과 환원당 함량은 새청무보다 프로자스민, IPS가 낮게 나타났다. 파쇄립의 비율은 국내 육성 품종이 8.6~35%로 태국쌀과 새청무보다 높게 나타나 도정 효율을 높일 필요가 있을 것으로 생각된다. 최소 가열시간은 새청무가 약 30분으로 가장 길었으며, 아미면이 약 20분, 그 외 품종이 약 25분으로 나타났다. 퍼짐성과 흡수성은 프로자스민이 가장 낮았으며 태국쌀이 가장 높았고, 용출된 고형물은 장립종 쌀이 대체로 높은 값을 보였다. 결론적으로 장립종 쌀 가공제품의 활성화를 위해서는 기존 쌀과의 차이를 고려하여 최적 가공조건을 선정하고 품종별 쌀의 특성을 강조한 제품 개발이 필요할 것으로 보인다.

P2-46

RGB-D 딥러닝 기반 다축 로봇을 활용한 비정형 감자 자동 박피 시스템 개발

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최근 식품 관련 대형업체들은 원물 대신 전처리된 농산물을 공급하는 Central Kitchen 시스템을 도입하여 조리 과정 단순화와 비용 절감을 추구하고 있지만, 국내 전처리 업체에서 사용하는 기존 탈피기는 감자처럼 형태와 크기가 다양한 원물 가공 시 과도한 손실을 일으켜 약 80%는 수작업 박피에 의존하고 있다. 본 연구는 RGB D 기반 머신 비전과 AI 기법을 결합해 비정형 감자의 미박피·변질 부위를 정밀 검출하고, 자동 생성된 경로에 따라 다축 로봇이 고정밀 박피를 수행하는 3 D 비전-로봇 통합 가공 시스템을 제안한다. 제안된 시스템은 MobileNet-V2 기반 DeepLabV3 네트워크를 활용한 미박피 영역 이진 세그멘테이션으로 Mean IoU 0.86, Pixel Accuracy 0.92를 달성하였으며, ICP 알고리즘을 활용하여 4대의 RGB-D 센서에 대해±8 mm 이내로 정합하고 이진 세그멘테이션 정보로 통합하여 미박피 영역에 대한3-D 메시를 구축하였다. 구축된 메시 표면에 나선형 경로를 생성한 뒤 ISO 6983 형식으로 변환한 뒤 자체 개발한 다축 로봇 제어기를 통해 엔드이펙터의 경로 정확성을 시뮬레이션으로 검증하였다. 제안된 파이프라인은 다중 시점 3 D 정합, 인식, 메시 생성, 경로 계획, 로봇 제어를 완전 자동화하여 식품 전처리 공정의 고수율·무인화를 실현하고, 노동력 및 원재료 비용 절감에 기여할 것으로 기대된다. 본 연구는 농림축산식품부의 재원으로 농림식품기술기획평가원의 지원을 받아 수행되었습니다 (RS-2004-00410044, 박피 등 원재료 손실 최소화를 위한 전처리 협동 기술 개발).

P2-47

Comparative analysis of the physicochemical properties of three whole grain powders (brown rice, buckwheat, and oats) for the development of senior-friendly food ingredients

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This study aimed to provide baseline data for developing senior-friendly food ingredients by comparing the physicochemical properties of three whole grains—brown rice, buckwheat, and oats—milled under identical conditions (120 mesh). Brown rice showed the highest milling yield (95.1%). Oats had the highest lightness (L, 63.88) and yellowness (b, 7.99), indicating good visual appeal. Oats also showed the best flow ability (Flow Index 0.73, Slope 0.72). They had the highest protein (13.37 g/100g) and fat (8.06 g/100g) contents, meeting the Korean Industrial Standards for senior-friendly foods and suggesting potential as a high-nutrition ingredient. Brown rice had the highest carbohydrate content (75.63 g/100g), making it suitable as an energy source. In particle PFT tests, oats showed the lowest bulk density (417.3 kg/m^3) and highest compressibility ratio (1.647), implying greater inter-particle voids and a soft, easily dispersible texture. These results demonstrate how whole grain powders can contribute to improved soft texture and nutritional balance in foods for the elderly. Further research will continue to optimize ingredient development for senior-friendly applications.

P2-48

찰옥수수(미백2호) 증숙처리 및 건조온도에 따른 분말 품질특성 비교

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옥수수(*Zea mays L.*) 재배면적은 '23년 15,481ha이며, 강원특별자치도는 5,393ha로 전국 35%를 차지하고 있다. 식품에서 분말 제품은 수분 함량이 낮고, 미생물적으로 안정하여 유통과 보관에 용이하다. 따라서 건조제품 개발을 위해 미백 2호를 증숙(100~110℃, 35~40분)처리, 건조 온도(40, 50, 60℃)별 품질특성을 비교하였다. 분말의 수분흡수지수는 무처리구 4.30~4.41 g/g, 증숙처리구 5.16~5.73 g/g로 증숙처리구의 수분흡수지수가 높았다. 수분용해지수는 무처리구 11.23~12.14%, 증숙처리구 8.27~8.74%로 증숙처리시 수분용해지수는 낮았다. 색도 중 황색도(b값)는 무처리구 8.91~12.05, 증숙처리구 13.74~13.84로 증숙처리시 높았다. 폴리페놀함량은 무처리구 9.73~15.15, 증숙처리구 2.13~2.84 mg TAE/g이였다. 플라보노이드함량은 무처리구 1.35~1.84, 증숙처리구 1.84~2.34 mg RE/g이였다. DPPH radical scavenging activity는 무처리구 45.46~52.72%, 증숙처리구 32.01~34.33%이였다.

P2-49

Comparative analysis of catechin and caffeine contents in green teas from the Jirisan region according to tea processing conditions

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The quality and functionality of green tea are strongly affected by subtle variations in tea processing. This study analyzed 10 green tea samples from the Jirisan region of Korea, each processed under different conditions including plucking time/method, steaming or pan-firing temperature/time, rolling, and drying. Using HPLC, we quantified eight catechins (EGC, C, EC, EGCG, ECG, GC, GCG,CG) and caffeine in both leaves and infusions. Total catechins in tea leaves ranged from 4671.09 mg/100g (Sample D) to 6911.82 mg/100g (Sample I), and caffeine from 1951.59 mg/100g (Sample E) to 2927.27 mg/100g (Sample J), showing significant variation. The steamed sample (Sample A) had lower EGCG (536.15 mg/100mL) in infusion than pan-fired samples B (784.93 mg/100mL) and H (868.23 mg/100mL). High-temperature (90-100°C), long-time (15-20 min) treatments degraded EGCG and ECG, while lower temperature (≤80°C) preserved them better. Rolling also impacted caffeine levels; Sample F, with intensive rolling, showed a high caffeine content (2753.84 mg/100g). These results highlight how processing parameters influence key functional compounds in green tea, offering valuable insights for optimizing functional green tea quality.

P2-50

Comparative analysis of Vitamin B_6 and antioxidant stability in cooked functional rice cultivars

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With increasing health concerns and declining white rice consumption, demand for nutritionally enhanced functional rice is growing. This study compared the retention of vitamin B_6 vitamers (pyridoxine, PN; pyridoxal, PL; pyridoxamine, PM) and antioxidant activities (DPPH, ABTS, and total polyphenol content) in 9 functional rice cultivars before and after cooking. HPLC-FLD was used for vitamin B_6 quantification. Among raw samples, Seonmyeong2 showed the highest total vitamin B_6 (66.46 μg/100 g), followed by Jeokjinju (65.31 μg/100 g) and Seonhyangmi (62.25 μg/100 g). Post-cooking, Heukjinju retained the highest vitamin B_6 (94.1%). PN showed the greatest loss (up to 43.4%), while PL and PM were more stable. For antioxidant activity, Jeokjinju retained 45.6% (DPPH) and 47.8% (ABTS), and Baekgangmi retained 34.3% of total polyphenols. Correlation analysis indicated a significant positive correlation ($r = 0.71$, $p<0.05$) between vitamin B_6 and DPPH retention after cooking, suggesting interconnected retention patterns across functional markers. These findings provide valuable insights into varietal selection and thermal stability for developing functional rice-based food products with high nutritional retention.

P2-51

Quality characteristics of meal replacement powder supplemented with lactic acid bacteria -fermented sweet potato powder

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This study was conducted to evaluate the functionality of meal replacement powders formulated with various concentrations (0-40%) of sweet potato powder fermented by lactic acid bacteria. The sweet potato powder was fermented using Leuconostoc inhae (L.i) and Weissella koreensis (W.k), and the fermented powders were added to the meal replacement products at different concentrations. As the proportion of fermented sweet potato powder increased, the moisture, fat, and protein contents of the products generally decreased, while the carbohydrate content tended to increase. Antioxidant activity was evaluated using DPPH radical scavenging capacity, and total flavonoid content and tannin content were also measured. As a result, the antioxidant activity improved as the amount of fermented powder increased, with the L.i-treated samples showing stronger radical scavenging effects than the W.k-treated ones. Total polyphenol content also increased with higher addition levels, and the W.k-treated group showed higher polyphenol content than the L.i-treated group. Tannin content showed a similar trend to polyphenols. These findings suggest that lactic acid bacteria-fermented sweet potato powder can enhance the antioxidant functionality of meal replacement products, and that the effect may vary depending on the bacterial strain used.

P2-52

Optimization of processing conditions for senior-friendly emulsion-filled gels using response surface methodology

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Emulsion-filled gels (EFGs) were developed for senior-friendly foods using high-oleic sunflower oil (HOSO) and inulin with different degrees of polymerization (HP, DP ≥ 23; GR, DP ≥ 10) via response surface methodology (RSM). A central composite face-centered design optimized EFGs development. Independent variables were HOSO content (27, 32, 37%), inulin content (19, 22, 25%), and the ratio of inulin HP to GR (0:4, 2:2, 4:0). Response variables were hardness, cohesion, and springiness of EFGs. Lack of fit for cohesion and springiness were not significant (p=0.269, 0.203), indicating adequate model fitting, and R^2 values for all response variables ranged 0.84~0.95, showing goodness of fit. RSM results showed cohesion was negatively affected by HOSO content and HP to GR ratio ($p<0.05$), while hardness was positively affected by inulin content ($p<0.05$). Springiness negatively affected by HP to GR ratio ($p < 0.05$). Based on the Korean standard for stage 3 senior-friendly foods, which specifies a hardness of ≤ 20,000 N/m² for foods swallowable by tongue, all EFG formulations developed in this study met the required hardness criterion. This study provided processing conditions of EFG texture applicable to designing special foods for elderly or individuals with dysphagia.

P2-53

Useful components of pet food materials using fermented herbs by *Lentinula edodes* mycelial

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As the companion animal population grows, there is increasing demand for high-quality pet food with balanced nutrition and functional health benefits. In this study, a mycelial fermentation approach was applied to improve the nutritional safety and efficacy of mushrooms and medicinal herbs for canine consumption. Oats were soaked in aqueous extracts of Dendropanax morbifera and Eriobotrya japonica, followed by fermentation with L. edodes strain KCTC 18874P. The resulting product, referred to as FMEJDMOLEM (Fermented L. edodes with E. japonica and D. morbifera on Oats), was analyzed for its nutritional and safety profile. FMEJDMOLEM exhibited significantly elevated levels of β-glucan, total polyphenols, essential amino acids, and vitamins B1 and B2, compared to non-fermented controls. Mineral and heavy metal analysis confirmed a calcium-to-phosphorus (Ca:P) ratio below 1:0.8, which is appropriate for canine nutrition, and no detectable levels of lead (Pb) or cadmium (Cd), indicating high safety for pet food application. These results demonstrate that herbs fermentation using L. edodes mycelium can enhance nutritional value and safety, offering promising potential for development into a functional dog food ingredient. Ongoing studies on physiological activity will further validate its applicability in the sector of companion animal health.
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P2-54

Nutritional composition and functional potential of *Pleurotus ferulae* compared to *Pleurotus eryngii*

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Pleurotus ferulae, a wild edible and medicinal mushroom native to China and Central Asia, has gained attention due to its nutritional and pharmacological properties. With recent advancements in cultivation techniques, including the development of non-sterile mass production methods in Korea, *P. ferulae* is now being considered for use as a functional food ingredient. This study aimed to evaluate the functional potential of *P. ferulae* by analyzing its nutritional and bioactive compound content, using Pleurotus eryngii (king oyster mushroom) as a reference. The results revealed that *P. ferulae* contained significantly higher levels of organic acids, free and total amino acids, potassium, magnesium, and vitamin B compared to P. eryngii. Notably, ergothioneine content in *P. ferulae* reached 9.41±0.5 mg%, approximately 2.54 times higher than that in P. eryngii (3.71±0.1 mg%), while vitamin C content was 0.95±0.06% in *P. ferulae*, about 3.39 times higher than in the control. These findings suggest that *P. ferulae* is a rich source of bioactive nutrients and holds significant potential as a functional food ingredient. Further studies on physiological activities and compound isolation are expected to support its industrial application in health-promoting products. This research was supported by the Ministry of Trade, Industry & Energy (P0020990).

P2-55

Metabolomic and bioactivity comparison of white and brown variants of *Hypsizygus marmoreus*

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Hypsizygus marmoreus, commonly known as beech mushroom, is widely appreciated for its nutty flavor, savory taste, and crisp texture. Beech mushrooms are classified by cap color, and phenotypic differences are known to influence their taste and nutritional composition. This study aimed to compare the metabolite profiles and biological activities of white and brown beech mushrooms. A total of 42 metabolites were identified in the white phenotype, while 47 were quantified in the brown beech mushroom. Major volatile compounds detected included hexanal, pentanal, 1-hexanol, and 1-pentanol. Brown beech mushrooms showed higher levels of hexanal and overall volatile content, whereas white mushrooms contained more pentanal and 1-pentanol. Furthermore, the total phenolic content was significantly higher in the brown beech mushroom. Both white and brown beech mushroom extracts exhibited biological activities; however, the brown beech mushroom extract demonstrated superior antioxidant and anti-inflammatory effects. These results highlight the phenotypic influence on metabolite diversity and functional properties in beech mushrooms, providing a scientific basis for the selection and utilization of mushroom cultivars in food and health-related applications. This research was supported by the Ministry of Trade, Industry & Energy (P0020990).

P2-56

Textural changes in Lentinula edodes pileus and stems under different thermal treatments

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Lentinula edodes, commonly known as shiitake or oak mushroom, is one of the most widely cultivated edible mushrooms worldwide and has been traditionally used in East Asian cuisine and medicine. Despite extensive knowledge of its health benefits, limited research has addressed the effects of thermal processing on the texture and structural integrity of *L. edodes*. This study investigated the textural changes in *L. edodes* subjected to two cooking methods using roasting and blanching applied separately to the pileus and stem portions. Mushrooms were harvested from Jangheung County, Korea. Results showed that hardness, gumminess, and chewiness decreased with prolonged roasting, whereas these properties increased with extended blanching. In contrast, fracturability, springiness, resilience, and cohesiveness remained relatively constant across treatments. The increase in hardness during blanching was attributed to moisture evaporation and structural densification due to shrinkage. Conversely, the increase in moisture content during roasting contributed to softening of the tissue. These findings provide practical insights into how different cooking methods influence the texture of *L. edodes*, which is relevant for food processing and culinary applications aiming to preserve or enhance mushroom quality. This study was supported by a grant of the Standardization of Oak Mushroom Project, Jangheung county.

P2-57

건조방법을 달리하여 제조한 품종별 감자 분말의 품질 특성 비교

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감자는 영양적 가치와 이용 가능성이 우수한 식재료이나 저장성과 활용성의 한계로 인해 다양한 가공 형태 개발이 요구된다. 분말은 식품 산업 전반에 폭넓게 활용 가능한 기본 형태로, 효과적인 감자 분말 제조 기술은 감자의 이용률 향상과 가공 산업 확대에 기여할 수 있다. 본 연구에서는 감자 가공 제품 개발 및 품질 개선을 위한 기초연구의 일환으로 국내에서 주로 재배되는 감자의 품종별 가공 적합성과 건조 방법에 따른 품질 특성 차이를 분석하였다. 국내 재배 감자 품종 수미, 대서, 남작, 은선 4품종을 선발하고 열풍, 송풍, 동결, 팽화의 네 가지 건조 방법으로 각각의 분말을 제조하여 주요 품질 특성을 비교 분석하였다. 그 결과, 수분흡수·용해지수에서는 동결건조와 팽화가 높은 값을 보였으며, 용해도 및 팽윤력, 복원력 측면에서는 열풍건조가 우수했다. 한편, 수미와 은선은 수분흡수·용해지수가 높게 나타났고 입자 구조가 균일하게 관찰되었다. 특히 은선은 복원력이 가장 뛰어났으며, 수미는 당도가 높았다. 반면, 대서는 수분흡수·용해지수와 복원력이 상대적으로 낮았다. 색도 및 갈변도 분석에서는 수미와 남작이 안정적인 색도를 유지했다. 이상의 결과를 통해 가공식품 소재로의 이용성 향상에 도움이 되는 자료로 활용될 수 있는 것으로 판단되었다.

P2-58

Investigation of NaCl diffusion and hardness changes in kimchi cabbage by vacuum and tumbling brining using hyperspectral imaging with feature selection

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The aim of this study was to propose a method for predicting the quality properties of salted kimchi cabbage (SKC) subjected to tumbling and vacuum salting treatments, by combining short-wave infrared hyperspectral imaging (HSI) and machine learning. Uninformative variable elimination (UVE) and successive projections algorithm (SPA) were employed for spectral feature selection to develop simplified predictive models. The PLS models, incorporating UVE and SPA with appropriate preprocessing showed high predictive performance for salinity (Rp^2=0.834, RPD=2.32) and hardness (Rp^2= 0.899, RPD=3.02). UVE-selected regions (1400 nm, 1500-1600 nm) were associated with O-H overtones of water, while SPA-selected regions (1200-1300 nm, 1700 nm) were linked to cell wall composition, particularly C-H bond absorption. SKC treated with tumbling and vacuum exhibited microstructural damage from mechanical impact, along with increased Na and Cl content and decreased moisture, influencing the spectral reflectance. By transferring the PLS models to color chemical maps, the distributions and variations of salinity and hardness were visualized. This research highlights the potential of HSI for non-destructive quality assessment of SKC under different treatments using machine learning.

P2-59

Optimization of UV irradiation for enhancing functional components in *Lentinula edodes* stipe saccharification solution

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Lentinula edodes(oak mushroom) is widely consumed for its flavor and health benefits. While the cap is typically preferred, the stipe is underutilized due to its tough texture and low market value, despite similar nutritional content. This study aimed to enhance the functional value of *L. edodes* stipe by optimizing UV irradiation conditions for its saccharification solution. UV exposure promotes the conversion of ergosterol to vitamin D_2, increasing its nutritional potential. Stipe saccharification solutions were prepared and irradiated with UV for varying durations. The highest β-glucan and vitamin D_2 levels were observed at 7 minutes of UV exposure, while ergosterol content peaked at 81.5 mg% after 9 minutes. These findings suggest that UV-treated stipe saccharification solution may serve as a value-added ingredient for natural sweeteners, food additives, and other functional food applications, contributing to the effective utilization of mushroom by-products in the food industry. This study was carried out with the support of 'R&D Program for Forest Science Technology (Project No. 2020198A-2022-BA01)' provided by Korea Forest Service (Korea Forestry Promotion Institute).

P2-60

Exploring the suitability of apple pomace processing: for the development of upcycled food products

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This study compared and analyzed the chemical properties and components of apple juice and apple pomace after juicing apples for the purpose of developing upcycled food materials. Additionally, the yield, general components, dietary fiber, and PFT (powder flowability test) were compared and analyzed for each processing method using a pulper finisher and pneumatic juicer. When apples were categorized into raw apples, apple pomace, and apple juice, the general component analysis showed that apple pomace had the highest protein content at 4.72 g/100 g, fat 1.38 g/100 g. Among minerals, Ca, Mg, Fe, Mn, and P were higher in apple pomace, K was higher in raw apples, and Na was higher in apple juice. Dietary fiber content was higher in apple pomace than in raw apples, and insoluble dietary fiber was higher than soluble dietary fiber. Ursolic acid levels were lowest in apple juice, followed by apple pomace, and highest in the original apple. The juice yield from the pulper finisher was 57% and pneumatic press was 62.5%. The yield of apple pomace pressed with the pulper finisher was 31.2%, while the yield of apple pomace pressed with a pneumatic press was 33.3%. There were no significant differences in the moisture, protein, fat, ash, and carbohydrate contents of the juice and apple pomace. Apple pomace processed with the pulper finisher had higher soluble dietary fiber, while apple pomace processed with the pneumatic press had higher insoluble dietary fiber and total dietary fiber. Additionally, the hemicellulose content was higher in apple pomace processed with the pulper finisher (7.5 g/100 g) than in apple pomace processed with the pneumatic press (4.5 g/100 g). Apple pomace showed higher yields when dried with cold air (40°C) than with hot air (60~70°C), and the L value increased as the drying temperature rose. The flow function of apple pomace dried at 60°C after pulper finishing was 0.69 kPa, while that of apple pomace processed using a pneumatic press was 0.52 kPa. Friction Angles was 69.9° for pulper finishing and 57.6° for pneumatic pressing. Apple pomace was utilized to develop apple liquid tea, leather sheet paper, and leather products, and research on food byproducts will continue.

P2-61

Comparative analysis of Icheon-grown unripe peaches for beverage development

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This study analyzed the physicochemical characteristics of unripe peaches cultivated in Icheon to develop a low-sugar beverage for all age groups. Three cultivars—*Janghowon Hwangdo*, *Great Jumbo Akatsuki*, and *Kawanakajima Hakuto*—were harvested at 50 and 60 days after full bloom. *Janghowon Hwangdo* showed the highest soluble solids content at 50 days, as well as the highest reducing sugar content—175,411.11±3,097.19 ppm at 50 days and 210,077.78±1,895.41 ppm at 60 days—and the highest polyphenol content at both stages (1,174.17±5.05 ppm). Antioxidant activity (DPPH, ABTS) increased at 60 days, with *Janghowon Hwangdo* demonstrating the strongest activity(DPPH: 65.29±4.77%; ABTS: 37.13±2.17%). These results suggest its potential for low-sugar functional beverage development.

P2-62

Characteristics of rice koji salt using vegetable broth

Dong Ho Kim*, Jeong Been Park*, Jung Min Su
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We investigated the characteristics of rice koji salt manufactured using vegetable broth. The ingredients used in vegetable broth were kelp, anchovies, green onions, onions, carrots, and shiitake mushrooms. The control used water instead of vegetable broth.The rice koji was made by inoculating white rice with Aspergillus oryzae to make a broth. The salt used was refined salt and sea salt. The items analyzed were sugar content, acidity, pH, salinity, mold cfu, crude fat, and crude protein. The crude protein content of the control was slightly lower than that of all vegetable broth treatments. The other results did not show significant differences. In the future, we plan to conduct amino acid content analysis and sensory evaluation to determine vegetable broth ingredients suitable for rice koji salt.

P2-63

Characteristics of rice koji salt using vegetable broth

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As the cultivation area of Aralia elata sprout in Gangwon-do increases, research on high-quality Aralia elata sprout cultivation technology is required from farmers. The quality of Aralia elata sprout that was capped and untreated was compared. The temperature of Aralia elata sprout that was capped was maintained higher than that of the uncapped Aralia elata sprout, and the relative humidity was also higher. The length, thickness, and weight of the Aralia elata sprout that was capped were all significantly higher. ($P<0.001$). When capping was performed by dividing into 5 zones, there was no significant difference in the quality ofAralia elata sprout by zone. In addition, there was no significant difference in the quality of the seeds by capping period (early March, mid-March, late March, and early April).

P2-64

Designing emulsion gels with microfibrillated cellulose and deacetylated glucomannan for texture control for fat substitutes

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In this study, alternative fat systems were developed using plant-based biopolymers to reduce health risks associated with excessive fat intake. Oil-in-water (O/W) emulsion gels were formulated by combining microfibrillated cellulose (MFC) derived from grapefruit peel with konjac glucomannan (KGM) showing various degrees of deacetylation such as 35.71%, 62.24%, and 94.90%. Analyses of oil/moisture retention, texture, molecular interaction, and rheology showed that partial deacetylation enhanced gel strength of final emulsion gels. However, excessive removal of acetyl groups caused steric hindrance, leading to particle aggregation and structural disruption, which are also confirmed by CLSM analysis and increased oil binding ability. These results suggest that combining MFC with deacetylated KGM at lower levels offers a promising approach to create stable, fat-like systems for healthier food applications. This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry (IPET) through Agriculture and Food Convergence Technologies Program for Research Manpower development, funded by Ministry of Agriculture, Food and Rural Affairs (MAFRA)(RS-2024-00402136).

P2-65

Processing characteristics and quality changes of hot-air puffed snacks based on Icheon rice powder with additional Ingredients

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This study aimed to develop hot-air puffed snacks using Icheon rice powder and evaluate the effects of adding soybean and black sesame powders on their textural and physicochemical properties. Samples were puffed at temperatures from 210°C to 230°C and analyzed for Water Absorption Index (WAI), Water Solubility Index (WSI), color, and texture. According to the analysis, snacks with soybean powder exhibited increased hardness, while those with black sesame powder showed a softer texture. This is thought to be due to the soybean protein forming strong, dense structures during heating, which suppress expansion and harden the structure, whereas the high fat content in black sesame interferes with starch and protein bonding, resulting in a less dense and softer texture. Puffing temperatures between 215°C and 225°C resulted in relatively favorable expansion and textural properties, suggesting this range may be optimal. These results demonstrate the potential for developing puffed snacks with diverse textural properties by incorporating ingredients such as soybean and black sesame into Icheon rice powder and applying optimized thermal processing conditions.

P2-66

Comparison of changes in quality characteristics of fermented skate according to storage period by country

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Skate (*Raja kenojei*) is a species of elasmobranch fish characterized by its unique method of fermentation, which occurs without the addition of salt, distinguishing it from the typical salting and fermentation processes used for general fish. This study aimed to investigate the physicochemical quality characteristics of fermented skate from different countries over varying storage periods. The analysis showed that Korean skate exhibited a pH of 8.68 ~ 9.03, ammonia nitrogen of 199.74 ~ 824.17 mg/100 g, amino acid nitrogen of 257.76 ~ 486.91 mg/100 g, volatile basic nitrogen (VBN) of 18.39 ~ 69.24 mg/100 g, and trimethylamine (TMA) of 0.42 ~ 8.66 mg/100 g. In contrast, imported fermented skate measured pH 8.62 ~ 9.03, ammonia nitrogen 119.54 ~ 825.14, amino acid nitrogen 185.90 ~ 430.03, VBN 13.67 ~ 62.37, and TMA 0.42 ~ 9.51 mg/100 g. The correlation analysis between storage days and quality parameters showed a significant positive correlation for all indicators except pH ($p<0.05$). This study shows that physicochemical characteristics that increase during storage period due to protein decomposition and fermentation can be used as scientific indicators for quality standardization of fermented skate across different countries and storage durations.

P2-67

Comparison of protein metabolism-related quality characteristics and oxidative stability changes in low temperature (0℃, 4℃) storage fermented skate

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Fermented skate is a food that has been aged through processes such as deskinning and shaping after removing non-edible parts from skate (Rajiformes Rajidae). In this study, changes in urea and ammonia concentrations associated with protein metabolism were analyzed and compared during the storage period of skate samples from different origins at 0℃ and 4℃. Free fatty acid (FFA) and TBARS were also measured to evaluate lipid oxidative stability. As results of the analysis, urea concentrations decreased markedly on storage days 3 and 6, gradually declined as the storage period progressed, and eventually maintained at the lowest level, while ammonia concentration progressively increased over time. A strong negative correlation between urea and ammonia concentrations was observed ($r = -0.764 \sim -0.966$), depending on storage temperature and origin ($p<0.01$). FFA levels slightly increased during the storage period. TBARS indicated an overall increasing tendency during storage, followed by a slight decrease and maintenance at a certain level. In the case of FFA and TBARS, significant differences ($p<0.05$) were detected depending on storage temperature after day 6. These results suggest that both storage temperature and duration should be considered for the quality control of fermented skate.

P2-68

Evaluation of high-value utilization potential of mackerel (*Scomber japonicus*) by-products through compositional analysis

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As seafood consumption continues to increase, a growing amount of by-products is generated during processing, leading to increased interest in the industrial utilization. This study aimed to evaluate the potential use of mackerel (Scomber japonicus) by-products as food ingredients by measuring body length and weight, and analyzing moisture, crude fat, and fatty acid composition. The crude fat content was highest in the skin at 19.37 ± 0.25 g/100 g, and the viscera contained 5.71 ± 0.27 g/100 g, both exceeding the 4.19 ± 1.94 g/100 g found in the muscle. In particular, the skin also showed high levels of unsaturated fatty acids. Oleic acid contained 44.93 ± 4.74 mg/ 100 g, accounting for 23.25 % of total fatty acids, while DHA was measured at 22.37 ± 1.77 mg/ 100 g, making up 11.57 %. These values were approximately 2.6 to 4.0 times higher than those found in the muscle. These findings suggest that mackerel by-products, particularly the skin and viscera, may serve as promising sources of lipids. However, further research is necessary to determine their practical application as food ingredients. The compositional data presented in this study may serve as a basis for the development of high-value-added products and for expanding the industrial use of underutilized fishery resources. This work was supported by the Korea Institute of Marine Science & Technology Promotion (KIMST), funded by the Ministry of Oceans and Fisheries (RS-2025-02263222, RS-2021-KS211539).

P2-69

Comparison of chemical properties of sesame seeds and perilla seeds according to processing method

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This study compared and analyzed the chemical properties and components of sesame seeds, perilla seeds, oil extraction liquid, seed residue, and raw materials for the development of upcycled food materials. The results of the general component analysis of raw sesame seeds and roasted sesame seeds showed that the moisture content was highest in raw sesame seeds at 3.17%, while the protein content was highest in roasted sesame seeds at 57.73 g/100g. The fat content was lowest in roasted sesame seed residue at 8.49 g/100g. Ash content was highest in roasted sesame seed residue at 9.90 g/100g. In the general component analysis of raw and roasted sesame seeds, moisture content was higher in raw sesame seeds than in roasted sesame seeds, while protein and ash content were higher in both raw and roasted sesame seeds in the seed residue. The fat content was higher in raw sesame seeds than in roasted sesame seeds. Insoluble dietary fiber and total dietary fiber were higher in raw sesame seeds than in roasted sesame seeds, and lower in roasted sesame seeds than in raw sesame seeds. Soluble dietary fiber was highest in raw sesame seed residue at 4.48 g/100g. Ca, K, Mg, Fe, Mn, Cu, and phosphorus were found in sesame and perilla seeds in the following order: seed residue 〉 raw material 〉 oil extract. Total polyphenols were higher in roasted sesame seeds (17.97) than in raw sesame seeds (10.74) and raw perilla seeds (70.09) than in roasted perilla seeds (65.98) and raw materials. Total flavonoid content was also higher in sesame residue. DPPH and ABTS antioxidant activity results showed that for both sesame and perilla, sesame and perilla residue 〉 raw material 〉 oil extract. The high protein, ash, mineral, dietary fiber content, and antioxidant activity of sesame and perilla residue were confirmed, and plans are underway to develop processed products utilizing these properties.

P2-70

Effect of whey protein isolate coating on the quality preservation of cherries

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This study evaluated whey protein isolate (WPI) as an eco-friendly coating material for food contact applications. WPI solutions (7% and 10% w/v) were heat-treated to induce protein denaturation, followed by the addition of glycerol (40-60% w/w). After drying at 50°C, films were formed, and the formulation with 10% WPI and 50% glycerol was selected for further testing. The WPI film surfaces were charged with chlorine to impart antimicrobial properties. To investigate the antimicrobial effects of the films, cross-contamination tests were conducted using spinach: bacterial transfer was evaluated from contaminated spinach to stainless steel (SS), and from SS to clean spinach. In addition, to determine applicability to food materials for storage, the WPI coating was applied to cherries. Changes in fruit hardness and weight loss were monitored for up to 7 days. Compared to the uncoated ones, coated cherries maintained visual quality without degradation, showed reduced weight loss, and improved hardness retention. These findings indicate that WPI-based coatings can contribute to prolong the shelf-life of fresh produces and enhance food safety measures by providing antimicrobial effects and reducing cross-contamination.

P2-71

Development of a cultured meat model using whey protein isolate and evaluation of its mechanical properties

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The rising global population is driving up the demand for dietary protein. Cultured meat is emerging as a promising alternative to conventional livestock which presents significant environmental and ethical concerns. Most muscle cells gaining interest as sources of cultivated meat are anchorage-dependent, they need a scaffold to attach and grow. The issues are that most existing scaffolds are non-edible and must be removed before processing to final products for consumption. To overcome the limitation, an edible scaffold based on by-products of cheese processing were developed. Specifically, microscale scaffolds based on whey-protein isolate (WPI) were fabricated. These WPI scaffolds supported the proliferation and differentiation of muscle cells, enabling the production of cultured meat. Finally, we compared the mechanical properties of the model cultured meat as a function of scaffold composition and formulation, using both rheometer and texture-profile analysis (TPA).

P2-72

Production of green tea jelly using theanine and its physiochemical characterization

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Theanine, the major amino acid and a sweet umami component of green tea, has significant anti-stress effects on humans. From green tea leaves, theanine was extracted at 80℃ for 2h using low temperature, high pressure extractor, and caffeine was removed using an HP-20 column with 80% ethanol. Theanine extracts were applied to produce functional jelly using three kinds of gelling agents (I, II, and III) or various concentrations of theanine extracts (10-50%). Theanine jelly was characterized with respect to its physical property, product stability, and physiological function. Gelling agent III (tamarind gum, xanthan gum, and locust bean gum=2:3:5, w/w/w) and S3 (35% theanine extracts) jelly exhibited optimum texture properties with lower hardness and high springiness. Among theanine jellies, S3 exhibited optimum product stability, high DPPH scavenging, and acetylcholinesterase (AChE) inhibitory activity. These results indicate that the theanine extract from green tea without caffeine could be applicable to food or pharmaceutical field as a neuroprotective compound.This study was supported by the Agriculture Science and Technology Development Program (RS-2025-10202968) of the Rural Development Administration.

P2-73

Development and characterization of sericin based bigels as functional fat replacers in baked products

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Although sericin has various physiological functions, its application in food systems remains limited. Therefore, this study developed sericin-based bigels using sericin hydrogel and glycerol monostearate (GMS) oleogel as a fat replacer. The optimal formulation (30 g hydrogel:20 g oleogel) was determined by response surface methodology (RSM). Rheological, DSC, and FTIR analyses indicated that the optimized bigel exhibited good mechanical and thermal stability through physical interactions, along with superior oxidative stability compared to commercial solid fats. Furthermore, the bigel was applied to cookies to evaluate its functionality. With increased bigel substitution, fat content decreased while protein increased, affecting texture and color. Sensory evaluation revealed no significant differences between the control cookies and those with bigel substitution levels up to 50%. Cookies containing curcumin-loaded bigels demonstrated improved curcumin retention during storage (25 °C) and sustained release under simulated digestion, suggesting its dual function as both fat replacer and delivery matrix. These findings highlight the potential of sericin-based bigels for use in bakery products as a multifunctional food ingredient.

P2-74

A study on image preprocessing for CNN-Based classification of rice whiteness

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Rice processing is carried out in Rice Processing Complexes (RPCs), where harvested rice undergoes dehulling and milling to produce white rice. Among these processes, milling is a critical step that directly affects head rice yield (HRY), eating quality, and appearance, thereby influencing both the economic value and palatability of the final product. In RPCs, the degree of milling (DOM) is typically assessed by milling technicians through visual inspection and measured using a whiteness meter. However, technician evaluations are subjective, and using a whiteness meter requires the cumbersome process of sampling directly from the milling machine during operation. Recently, the use of artificial intelligence (AI) has been increasing in the grain industry, particularly for applications such as disease detection and quality inspection. To achieve higher learning efficiency and reduce training time, various preprocessing techniques can be considered. Therefore, this study was conducted to investigate image preprocessing methods aimed at improving the training efficiency of convolutional neural network (CNN) for rice milling evaluation.

PART III Food Chemistry and Analysis

P3-01

Effect of cooking methods on the volatile sulfur compound profiles of cruciferous vegetables

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Volatile sulfur compounds (VSCs) are known for characteristic pungent and bitter flavors, as well as for their therapeutic potential. This study investigated the VSC profiles of different cruciferous vegetable samples using headspace solid-phase microextraction (HS-SPME)/chromatography-mass spectrometry (GC-MS) technique and chemometric analyses. Cruciferous vegetables subjected to various cooking methods, including blanching, steaming, drying, soaking, boiling, and pickling. The method for VSC analysis demonstrated satisfactory repeatability (RSD 4.04-8.65%) and reproducibility (RSD 1.43-4.85%). A total of 22 VSCs including sulfides, disulfides, trisulfides, isothiocyanates, thiazoles, and sulfur-containing nitriles were identified and quantified. Dried radish strips (mumallaengi) showed the highest total VSC content (37.62±0.83 mg/100 g FW), followed by blanched Brussels sprouts (28.80±0.92 mg/100 g FW). Although cooking typically reduced VSCs in most vegetables, blanching increased VSCs in Brussels sprouts, likely due to its unique matrix characteristics This study provides reliable data on VSCs in cruciferous vegetables and highlights the impact of different cooking methods on their VSC profiles. This study was carried out with the support of "Cooperative Research Program for Agriculture Science and Technology Development (Project No. RS-2022-RD010244)" Rural Development Administration, Republic of Korea.

P3-02

Metabolomic profiling of garlic cultivars following internal sprouting

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Garlic is commonly stored long-term after harvest for year-round distribution, but internal sprouting during storage often reduces quality. This study aimed to investigate metabolite changes associated with sprouting across four cultivars (Daeseo, Namdo, Uiseong, and Hongsan). Internal sprouting was induced by holding garlic at room temperature for one week. Metabolite profiling was conducted on three tissues (peel, root, and clove flesh) using GC-MS and UPLC-QTOF MS. PLS-DA score plots showed distinct cultivar-dependent patterns: Daeseo, Namdo, and Uiseong in the peel; Namdo and Hongsan in the roots; and Daeseo and Namdo in the clove. A total of 55, 80, and 40 differential metabolites were identified in the peel, root, and clove, respectively, including sugars, amino acids, peptides, organic acids, phenolic compounds, and steroidal saponins. Among them, amino acids, peptides, and saponins showed notable changes across all cultivars after sprouting. Although further validation is needed, these compounds may serve as potential biomarkers for predicting internal sprouting during long-term storage of garlic. This study was supported by the Rural Development Administration research project No. PJ01719101.

P3-03

녹차씨유 혼합에 따른 해바라기유의 산화 안정성 향상 효과

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해바라기유는 linoleic acid를 다량 함유하고 있어 산화 안전성이 낮은 식용유 중 하나로 잘 알려져 있다. 본 연구에서는 해바라기유에 항산화 성분이 함유된 압착녹차씨유를 혼합함으로써 산화 안정성을 개선하고자 하였다. 해바라기유에 녹차씨유 5%, 10%, 그리고 20% (v/v) 로 혼합한 다음 이를 대상으로 품질특성 및 산화 안정성을 평가하였다. 녹차씨유 비율이 높을수록 적색도는 증가하였으나 황색도, 굴절률, 그리고 발연점은 해바라기유와 거의 유사하였다. 또한, 녹차씨유 비율이 높을수록 산값은 높아졌으나 아이오딘값은 감소하였으며, 단일불포화지방산(MUFA) 함량은 증가하고, 다중불포화지방산(PUFA)는 감소하였다. 해바라기유/녹차씨유 혼합유를 대상으로 OXITEST를 이용한 유도시간(induction period, IP)를 측정한 결과, 단독의 해바라기유와 녹차씨유의 IP는 각각 149일과 140일이었으나 10%의 녹차씨유를 첨가한 혼합유의 IP는 198일로 측정되어 녹차씨유 첨가가 산화 안정성을 증가시킴을 확인할 수 있었다. 이는 녹차씨유의 카테킨, γ-토코페롤 등의 천연 항산화제가 PUFA의 산화를 억제한 결과로 판단된다. 그러나 20%의 녹차씨유를 첨가한 혼합유는 10%의 녹차씨유를 첨가한 혼합유에 비해 산화 안정성이 낮아졌다. 이상의 결과로부터 녹차씨유 첨가가 해바라기유의 산화 안정성 향상에 도움을 줄 뿐만 아니라 식품업사이클링 소재로써 녹차씨유의 활용이 기대된다.

P3-04

Structural identification of hydroxycinnamoylsucrose derivatives from rice bran

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Rice (*Oryza sativa* L.) is commonly consumed as white or brown rice. Brown rice contains various bioactive compounds, including γ-oryzanols, phenylpropanoic acids, hydroxycinnamoylsucrose derivatives, and tocopherols. Among these, several hydroxycinnamoylsucrose derivatives have biological effects, including antioxidant and anti-inflammotory activities and their contents are very different according to rice cultivars. However, studies on biological effects of hydroxycinnamoylsucrose derivatives remain limited. In this study, hydroxycinnamoylsucrose derivatives were purified and isolated from rice bran to evaluate their biological effects. HR-ESI-MS results indicated that flavonoid glycosides and hydroxycinnamoylsucrose derivatives were detected as the main compounds in the water-saturated n-butanol (BuOH) fraction of rice bran ethanol extracts. Five compounds were isolated from the BuOH fraction by ODS column chromatography and identified as 6-O-feruloylsucrose, 6-O-sinapoylsucrose, 3',6-di-O-sinapoylsucrose, 3'-O-sinapoyl-6-O-feruloylsucrose, and 3',6-di-O-feruloylsucrose by HR-ESI-MS and NMR analyses. In now, in vitro anti-inflammatory, neuroprotective, and anti-osteoclastogenic activities of 5 hydroxycinnamoylsucrose derivatives are evaluated.

P3-05

Oleanolic acid saponins and sulfonoglycolipid from glasswort (*Salicornia europaea*)

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Salicornia europaea, also known as glasswort, is widely distributed in salt marshes on beaches and among mangroves. The aerial parts have been shown to provide health benefits, such as antioxidant, anti-inflammatory, anticancer, and antihyperglycemic effects. Desalinated glasswort hot water extracts effectively inhibited osteoclast differentiation in RANKL-stimulated bone marrow-derived macrophage cells and contained various caffeoylquinic acids and oleanolic acid saponins by UPLC-ESI-QTOF MS/MS metabolomic analysis. This study focused on the purification and isolation of five oleanolic acid saponins (1-5) and a sulfonoglycolipid (6) from the desalted glasswort methanolic extract by silica gel and ODS column chromatography. These structures were determined using a combination of FT-IR, NMR, and MS analyses. Among them, compound 2 containing seco-glycopyranosyl moiety is an unusual compound and their structures and biological effects appear to be of great interest. Compound 6 (sulphonoglycolipid) is found for the first time in glasswort.

P3-06

Isolation and structural determination of acylated anthocyanins from purple sweet potato

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Sweet potato (*Ipomoea batatas L.*) is mainly consumed in Asia including Korea and has gained attention as a functional food ingredient due to its richness in bioactive compounds such as carotenoids, flavonoids, and phenolic acids. In particular, purple sweet potatoes contain high levels of anthocyanins, which exhibit various biological activities, including anti-inflammatory, antimutagenic, and hepatoprotective effects. Although several anthocyanins in purple sweet potatoes have been elucidated, further investigation of unknown anthocyanins is needed. In this study, anthocyanins were purified and isolated from purple sweet potatoes to elucidate their structures. Ethyl acetate (EtOAc) and water-saturated n-butanol (BuOH) fractions were obtained by solvent fractionation of 70% methanol extracts of purple sweet potato. In the LC-ESI-QToF-MS results, 27 compounds (caffeoylquinic acids) in the EtOAc fraction and 23 compounds (acylated anthocyanins) in the BuOH fraction were detected. Six anthocyanins were purified and isolated from the BuOH fraction using ODS and silica gel column chromatography. These compounds were identified as p-hydroxybenzoyl, caffeoyl, and feruloyl peonidin glycosides, based on MS and 1D- and 2D-NMR analyses.

P3-07

Identification of dihydroisocoumarins from leaves of *Hydrangea serrata*

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Hydrangea serrata is a deciduous shrub native to East Asia, particularly Japan and Korea. The leaves have traditionally been used for the treatment of fever, cough, and gastrointestinal disorders, and have natural sweetening properties attributed to dihydroisocoumarins. In addition, several dihydroisocoumarins have been reported to exhibit biological effects, including antioxidant, anti-inflammatory, anti-obesity, and anti-diabetic activities. Our preliminary experiments exhibited that various dihydroisocoumarins, including phyllodulcin and hydrangenol glycosides, were identified in the leaves of H. serrata by HR-ESI-MS analysis. Therefore, this study was to purify and isolate various dihydroisocoumarins from the leaves of H. serrata to evaluate their biological effects. Nine dihydroisocoumarins were purified and isolated from the methanol extracts of the leaves of H. serrata by ODS and silica gel column chromatography. Based on HR-ESI-MS and NMR analyses, these main compounds were identified as phyllodulcin, phyllodulcin-8-O-glucoside, phyllodulcin-3'-O-glucoside, hydrangenol, hydrangenol-8-O-glucoside, and hydrangenol-4'-O-glucoside. Research on biological effects of the isolated dihydroisocoumarins is conducted.

P3-08

Comparison of LC-MS-based non-volatile metabolites of four Korean laver cultivars

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This study compared the compositional characteristics of four Korean laver cultivars [Gopchang Gim (GG), Dol Gim (DG), Gimbap Gim (KG), and Jaerae Gim (JG)] through proximate composition and ultra-performance liquid chromatography-quadrupole time-of-flight mass spectrometry (UPLC-QTOF-MS)-based non-volatile metabolite analysis. Moisture content was the highest in JG, while crude protein levels were relatively higher in DG and KG. No significant differences in crude ash and crude fat contents were observed among the four laver cultivars. Fifty-three compounds were tentatively characterized by UPLC-QTOF-MS analysis. Principal component analysis (PCA) score plot exhibited that GG was distinguished from other laver cultivars. Orthogonal partial least squares discriminant analysis (OPLS-DA) confirmed that the four types of dried lavers could be effectively distinguished by their type. In addition, the contents of porphyra-334 and shinorine, known as bioactive compounds in laver, were higher in GG, with shinorine showing particularly notable differences. These findings contribute to understanding the compositional characteristics of different types of dried laver.

P3-09

Phospholipid contents in fruits, legumes, nuts, and seeds by processing methods

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The phospholipid (PLs) contents of fruits (14 types), legumes (4 types), nuts (2 types), and seeds (4 types) were analyzed using HPLC-ELSD before and after processing (peeling, boiling, and roasting). The calibration curves for NAPE, PE, PC, PI, and LPC showed excellent linearity ($R^2 > 0.99$), with limits of detection ranging from 0.13 to 0.26 μg/mL and limits of quantification from 0.36 to 0.86 μg/mL. In fruits, PE, PC, and PI were contained, and the PLs content of yellow peach was higher when the peel was retained, and the fruit juices contained trace amounts of PE, PC or PI. In legume, NAPE, PE, PC, PI, and LPC were contained, and boiled red kidney bean showed the highest total PLs content (1175.02 mg/100 g), with PC as major (736.28 mg/100 g), along with PE and PI ($p<0.05$). In all kidney bean samples, boiling increased total PLs by 1.18 to 1.37 times ($p<0.05$). In nuts and seeds, PE and PC were the major PL, and roasting increased PC content in pine nuts and perilla seeds by 1.18 and 1.16 times, respectively ($p<0.05$). Therefore, this study confirmed that the composition and content of PLs vary by food type and are influenced by processing and cooking. These findings suggest the potential use of this result for establishing a database of functional in agro-food products. This was supported by Cooperative Research Program for Agriculture Science and Technology Development from the Rural Development Administration (RS-2022-RD010069).

P3-10

Optimization of drying conditions for fortifying nutrients (magnesium L-lactate, calcium lactate, L-glutamic acid, and milt protein) in the quantitative analysis

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The Ministry of Food and Drug Safety's food additive regulations prescribe appropriate methods for the quantitative analysis of four fortifying nutrients, including magnesium L-lactate, calcium lactate, L-glutamic acid and milt protein, and require a drying step as part of the procedure. However, specific drying parameters are not explicitly defined. To address this issue, this study used thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) to determine the optimal dehydration temperature ranges for each fortifying nutrient. The results showed that magnesium L-lactate dehydrates stably without thermal decomposition between 120°C and 300°C, calcium lactate between 100°C and 220°C, L-glutamic acid below 190°C, and milt protein below 250°C. These temperature ranges were consistent with the loss-on-drying conditions described in the Food Additives Code. Subsequent quantitative analyses conducted under the optimized conditions met all regulatory specifications. These findings suggest that applying precisely controlled desiccation protocols can improve the accuracy of fortifying nutrient analysis and emphasize the need to standardize drying conditions in official methods.

P3-11

Development of a GC-MS/MS quantitative analytical method for the determination of restricted and prohibited substances migrated from food contact utensils, containers and packages

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Raw materials used in food contact utensils, containers, and packaging may migrate into food, posing risks to human health. A previous study established a screening method for 65 substances restricted or prohibited by the U.S. FDA and EPA, known to be used in plastic-based food contact materials. Migration testing on polymers such as polypropylene, polyethylene, and polystyrene identified 19 substances. Of these, representative analytes were selected for quantitative analysis based on hazard scores for human health reported in the literature. Test solutions were prepared by conducting migration tests using four food simulants—distilled water, 4% acetic acid, 20% ethanol, and n-heptane—under conditions specified in the Standards and Specifications for Utensils, Containers and Packages. A GC-MS/MS method was developed and validated. All analytes were detected with high specificity, and the limits of detection ranged from 0.4 to 3.4 μg/L. Sample preparation procedures were optimized for each simulant, and recovery rates met the performance criteria of the Joint Research Centre (JRC). This method is applicable for monitoring migration levels of restricted and prohibited substances from synthetic resin-based food contact materials.

P3-12

Comparative evaluation of antioxidant and sensory properties in five tomato accessions grown in Korea

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Tomato is one of the most widely consumed vegetables worldwide due to superior nutritional value and unique sensory quality. This study investigated the antioxidant capacity and sensory attributes of five tomato accessions grown in Korea. Antioxidant potential was assessed by ABTS, DPPH radical scavenging, reducing power activity, chelating effect, total polyphenol content, and total flavonoid content. Sensory evaluation was conducted to determine taste, flavor, and consumer preferences. The results showed that 'CBNU3' exhibited the highest antioxidant activity, along with elevated levels of total polyphenols and flavonoids. It also had high sensory scores for sweetness, sourness, saltiness, umami, aftertaste, and tomato-, fruity-, and sweety-like flavors, resulting in high overall consumer preference. The °Brix value was positively correlated with perceived sweetness, while acidity and vitamin C content were associated with the sourness. The °Brix/acidity ratio was not significantly related to the sensory qualities of the tomatoes. Our study provides a comprehensive characterization of the nutritional and sensory attributes of tomato accessions. The results could serve as preliminary data for future tomato studies and breeding programs for improving fruit quality. This research was supported by the Basic Science Research Program through the National Research Foundation of Korea funded by the Ministry Education, Science and Technology (project number RS-2024-00355164), Republic of Korea.

P3-13

Method validation and phospholipid analysis in Korean vegetables using HPLC-ELSD

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Phospholipids (PLs) are involved in biological functions including memory enhancement, increased cell membrane fluidity, and improved blood cholesterol levels. However, data on PL content in domestic agricultural food resources remain limited. The PLs analysis method using HPLC-ELSD were verified with in-house quality control, and the PL content in Korean vegetables (17 types) were assessed. The analytical method showed linearity (R2>0.99), LOD and LOQ (0.14-0.26 μg/mL and 0.36-0.86 μg/mL), and RSD values (3.4-10.1%) demonstrating good linearity, sensitivity, and reproducibility. The PL was primarily composed of PC (0.73-1506.87 mg/100 g) and PE (0.09-337.03 mg/100 g), with trace amounts of NAPE, PI, LPE, and LPC. The total PL content increased by 1.81- to 8.6-fold after blanching. In radish, the main PLs are PE, PC, and PI, which decreased by 5.65-, 1.05-, and 2.35-fold, respectively, upon drying. In pickled radish, the PC content increased by 2.70-fold, whereas no PLs were detected in salted radish. In contrast, NAPE and PC were present in radish leaves and sprouts, with higher concentrations in the sprouts. This study validated a reliable analytical method for PL. The predominant PLs in vegetables are PC and PE, and their contents tend to increase upon cooking. This was supported by Cooperative Research Program for Agriculture Science and Technology Development from the Rural Development Administration (RS-2022-RD010069).

P3-14

Evaluation of antioxidant activity and nitrite contents in outer leaves of kimchi cabbage under various decolorization conditions

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With the recent growth of the sports nutrition market, nitrate-rich ingredients are increasingly being utilized in the food industry. Among them, the outer leaves of Kimchi cabbage have drawn attention due to their high nitrate content and excellent antioxidant activity. This study aimed to explore the potential of Kimchi cabbage outer leaf juice as a functional ingredient for sports nutrition by evaluating its nitrate content and antioxidant activity under different decolorization conditions. Diatomite and activated carbon were used as decolorizing agents. The analysis of nitrate content revealed no significant changes across the different decolorization treatments. However, antioxidant activity significantly decreased when decolorization was performed using both diatomite and activated carbon, compared to using diatomite alone. In conclusion, while decolorization did not affect nitrate content, the use of both decolorizing agents negatively impacted antioxidant activity. Further evaluation will be conducted to assess the effect of varying levels of decolorizing agents on antioxidant activity.

P3-15

Functional enhancement of EGCG via nanoemulsification: debitterization, antibrowning, and anti-adipogenic application

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In this study, we enhanced the stability and functionality of epigallocatechin gallate (EGCG), a polyphenol abundant in green tea, by formulating an oil-in-water nanoemulsion using ultrasonication. Lecithin served as the oil-phase emulsifier, pectin was used as an aqueous-phase stabilizer, and gallic acid was added to mitigate browning. The optimized nanoemulsion achieved a high encapsulation efficiency (88.9%), fine droplet size (169.3 nm), and low polydispersity index (0.16), indicating a uniform and stable system. The nanoemulsion exhibited potent antioxidant activity (82% DPPH radical scavenging) and reduced browning by 63% compared to free EGCG. Furthermore, bitterness was decreased by approximately 50%, as evaluated using TAS2R16 + GIRK1/4 receptor assays in Xenopus laevis oocytes via two-electrode voltage-clamp recordings. In vitro experiments with 3T3-L1 adipocytes showed a 49% reduction in lipid accumulation and a 58% increase in triglyceride breakdown. These results suggest that nanoemulsification is an effective strategy to improve both the sensory qualities and biological efficacy of EGCG for functional food applications. This study was supported by the Agriculture Science and Technology Development Program (RS-2025-10202968) of the Rural Development Administration.

P3-16

Enzymatic transformation of pear pomace into hemicellulose-enriched fiber with prebiotic and anti-inflammatory effects

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Pear is widely cultivated, and in Korea, over 60% of harvested pears are processed into juice, generating about 25,000 tons of solid waste annually. Pomace—comprising pulp, peels, and cores—makes up 35% of this waste. Despite its high dietary fiber content (up to 75%), pear pomace poses challenges in waste management. This study aimed to optimize enzyme treatment to enhance dietary fiber composition. Screening identified Trichoderma reesei-derived CEP as the most effective enzyme, achieving a yield of 74.65% and hemicellulose content of 21.21%. Compared to untreated powder, enzyme-treated dietary fiber (PDE) showed a 2.5-fold increase in hemicellulose, 8-fold increase in solubility, 3-fold increase in water/oil-holding capacity, and reduced, uniform particle size. PDE also exhibited prebiotic activity by enhancing Bifidobacterium infantis growth by 9% and inhibiting Salmonella typhimurium by 50% relative to β-glucan. In RAW 264.7 cells, PDE reduced NO, TNF-α, and IL-6 levels by 30%, 71%, and 46%, respectively. These findings suggest PDE as a promising supplement to improve dietary fiber functionality, promote gut health, reduce inflammation, and modulate immune responses. This study was financially supported by Program for the Promotion of Group Research Activation (RS-2025-0822-01) of Chonnam National University and Establishment of a foundation for materialization of agricultural by-products (RS-2025-02263571) of National Institute of Crop and Food Science.

P3-17

Production of yuzu powder enriched with anti-adipogenic functional dietary fiber via combined enzymatic treatments

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Yuzu (*Citrus junos*) is rich in dietary fiber, flavonoids, and various bioactive compounds, yet its food applications are limited due to a strong bitter taste. This study aimed to improve the sensory and functional properties of yuzu through enzymatic treatment. A combination of commercial and lactic acid bacteria-derived enzymes—cellulase NY203, pectinase UF, and cellulase KN—was used to hydrolyze yuzu tissues. The treatment enhanced flavonoid and dietary fiber properties while significantly reducing bitterness. It also decreased levels of insoluble fiber components such as cellulose, hemicellulose, lignin, and pectin, likely due to enzymatic cleavage of structural bonds. Physicochemical properties were improved in the treated samples, showing 1.3-fold higher water-holding capacity, 1.1-fold oil-holding capacity, and 2.6-fold greater water swelling capacity compared to untreated yuzu. Bitterness was reduced by 50%, and in 3T3-L1 adipocytes, lipid accumulation decreased by 28% with enhanced lipolytic activity. These findings suggest that targeted enzymatic processing is effective for enhancing both the nutritional and sensory quality of yuzu, supporting its potential as a functional food ingredient. This study was supported by the Agriculture Science and Technology Development Program (RS-2024-00437307) of the Rural Development Administration.

P3-18

추출 용매에 따른 브로콜리 새싹의 설포라판 함량 및 생리활성 변화

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브로콜리 새싹 (*Brassica oleracea L. var. italica*)은 글루코시놀레이트(glucosinolate)와 설포라판(sulforaphane)을 포함한 다양한 생리활성 물질을 풍부하게 함유하며, 항암, 항염증, 항산화 등 건강 증진에 유익한 것으로 알려져 있다. 특히, 브로콜리 새싹은 성숙한 브로콜리보다 유용 성분 함량 및 건강 기능성이 우수하다고 보고되었다. 하지만, 브로콜리 새싹으로부터 설포라판을 비롯한 유용 성분을 효과적으로 추출하는 연구는 미흡한 실정이다. 본 연구에서는 브로콜리 새싹으로부터 추출 용매에 따른 설포라판 등의 유용 성분 함량의 추출 조건을 확립하고 이를 활용한 항산화 및 항염증 활성을 조사하고자 한다. 본 실험에 있어서 우즈베키스탄산 브로콜리 종자를 온도 20℃, 상대습도 70%, 광주기 16h/8h 조건에서 수경재배하였으며, 파종 후 3일 뒤 지상부 전체를 수확하여 시료로 준비하였다. 지상부에 포함된 브로콜리 새싹으로부터 유용 성분의 최적 추출 조건을 조사하고자 추출 용매에 따른 함량변화를 HPLC를 이용하여 분석 진행 중이다. 또한 RAW 264.7 대식세포를 이용한 세포 실험에서 용매 조건에 따른 생리활성(항산화, NO생성 억제 및 항염증)에 미치는 영향을 조사할 예정이다. 본 연구를 통해 추출 용매에 따른 브로콜리 새싹 유래 설포라판 함량 및 항산화/항염증 활성이 확인될 것으로 기대한다. 본 연구 결과는 수경재배를 통해 생산된 브로콜리 새싹 유래 설포라판 등을 포함한 기능성 성분의 추출 조건 및 생리활성의 검증으로 브로콜리 새싹 기반 기능성 식품 및 건강기능식품 개발을 위한 최적의 원료 가공 조건 설정에 기초 자료로 활용될 수 있을 것이다.

P3-19

Method optimization for the determination of deoxynivalenol in high-fiber foods using LC-PDA

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Deoxynivalenol (DON) is a representative trichothecene mycotoxin produced by Fusarium sp., and it is one of the most frequently detected toxins in cereal grains such as wheat, corn, and barley worldwide. Exposure to DON in humans can lead to symptoms such as vomiting, abdominal pain, and immune suppression, and chronic exposure may adversely affect growth. Accordingly, Korea has established regulatory limits for DON in cereals and related foods, and the official analytical methods specified in the Korean Food Code are primarily applicable to raw grains and their simply processed products. Recently, with growing public interest in health and body weight control. There has been an increasing demand for health foods made from plant-based ingredients rich in dietary fiber such as Psyllium Husk, and so it has been needed to manage the safety of this. However, for high-fiber health foods, it is difficult to apply the current official method for DON analysis effectively because of moisture absorption. To address this issue, a modified sample pretreatment method involving acid hydrolysis was introduced to break down dietary fiber and improve DON extraction. The improved method satisfied the validation criteria outlined by the CODEX guidelines.

P3-20

Development of a multi-analytical method for CBD and Δ^9-THC in jelly using LC-MS/MS

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Deoxynivalenol (DON) is a representative trichothecene mycotoxin produced by Fusarium sp., and it is one of the most frequently detected toxins in cereal grains such as wheat, corn, and barley worldwide. Exposure to DON in humans can lead to symptoms such as vomiting, abdominal pain, and immune suppression, and chronic exposure may adversely affect growth. Accordingly, Korea has established regulatory limits for DON in cereals and related foods, and the official analytical methods specified in the Korean Food Code are primarily applicable to raw grains and their simply processed products. Recently, with growing public interest in health and body weight control. There has been an increasing demand for health foods made from plant-based ingredients rich in dietary fiber such as Psyllium Husk, and so it has been needed to manage the safety of this. However, for high-fiber health foods, it is difficult to apply the current official method for DON analysis effectively because of moisture absorption. To address this issue, a modified sample pretreatment method involving acid hydrolysis was introduced to break down dietary fiber and improve DON extraction. The improved method satisfied the validation criteria outlined by the CODEX guidelines.

P3-21

QuEChERS-based method development and validation for polycyclic aromatic hydrocarbons in HMRs

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Polycyclic aromatic hydrocarbons (PAHs) are hazardous organic pollutants composed of two or more fused benzene rings arranged in linear, angular, or clustered structures. PAHs are well known as carcinogens, mutagens, and teratogens, posing significant risks to human health. These compounds can enter the human body through food, air, soil, and water, and are particularly generated during food cooking and processing. Therefore, a simple and efficient analytical method is required for accurate determination of PAHs in home meal replacements (HMRs). In this study, a QuEChERS-based method combined with GC-MS analysis was applied. Doenjang stew, ttukbaegi bulgogi, pasta, and gambas were selected as representative food matrices. Method validation was performed by evaluating the matrix effect (ME), specificity, linearity, limit of detection (LOD), limit of quantification (LOQ), precision, and accuracy. The results confirmed that this method is suitable for the reliable determination of PAHs across various HMR products. This research was supported by a grant(25192 MFDS 004) from the Ministry of Food and Drug Safety in 2025.

P3-22

Exploring regional variation in metabolite profiles of oriental wheat sprouts using feature-based molecular networking

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Feature-based molecular networking (FBMN) has become a widely used method for analyzing MS/MS data due to its capacity to visualize large datasets based on fragmentation ma similarity and to suggest possible structures using extensive cloud-based libraries. Additionally, it facilitates semi-quantitative comparisons between groups by evaluating differences in MS1 feature intensities. In the present study, FBMN analysis was employed to reinforce the identification of chemical markers that distinguish Oriental wheat samples based on their countries of origin. This method also aimed to uncover additional candidate markers. FBMN of the Oriental wheat sprout samples was conducted with grouping based on collection origin: Türkiye and Afghanistan. Analog-based library searches further enhanced the reliability of metabolite identification, providing plausible matches for many of the features. Thus, this integrative approach of using FBMN allows to understand the chemical diversity of Oriental wheat sprout and discover variations influenced by regional factors, potentially leading to improvements in both agricultural practices and nutritional quality.

P3-23

Quality analysis of postharvest storage temperature of purple corn husk

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Purple Corn 'Saekso 5' is a cultivar developed in Gangwon State Agricultural Reaseach & Extension Service for the extraction of anthocyanins. This cultivar is characterized by deep purple pigmentation in the husk and cob, and contains high levels of anthocyanins. The harvest period of 'Saekso 5' generally falls between early and mid-August, which presents challenges in storage and preservation when processing large quantities of samples simultaneously. In this study, quality analysis was analyzed on the husks of 'Saekso 5' under different postharvest storage temperatures to ensure high-quality raw material production. After harvest, the samples were stored at room temperature, -5°C, and 5°C for six weeks. Stored samples were collected weekly to analyze fungal mycotoxins such as aflatoxin and fumonisin, as well as the characteristic ingredients cyanidin-3-glucoside (C3G). During the storage period, aflatoxins B1, B2, and G1 were not detected in any samples. However, zearalenone levels increased rapidly from the second week at room temperature, while it was not detected at -5°C and was only detected in samples stored at 5°C after six weeks. C3G remained most stable when stored at -5°C for one week, but began to decrease at all storage temperatures after the second week. These findings may provide useful reference data for the quality control of purple corn as a raw material. This work was supported by the project "Development of functional food and natural thickener derived from purple corn by Gangwon-do" (RS-2024-00438488).

P3-24

Isolation and structural determination of saponarin from the by-product of malted barley (*Hordeum vulgare* L.)

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Sikhye is a traditional Korean beverage produced by saccharifying cooked rice with malted barley (*Hordeum vulgare L.*) extract. *Sikhye-pak* is a by-product of malted barley through filtration and pressing during Sikhye production. Barley is contained bioactive compounds such as phenolic acids, flavonoids, alkylamines, and dietary fiber. These bioactive compounds from barely have various health-promoting effects, including anti-oxidant, anti-inflammatory, anti-diabetic, and anti-obesity activities. In this study, we aimed to isolate and identify such bioactive compounds from *Sikhye-pak*, a by-product of malted barley. Liquid chromatography-electrospray ionizationquadrupole time-of-flight-mass spectrometry (LC-ESI-QToF-MS) analysis of *Sikhye-pak* detected 60 compounds, including procyanidin, vitexin, scoparin, isoorientin, isoschaftoside, and quercetin, among which saponarin was identified as the major compound. The 70% ethanol extract of Sikhye-pak was subjected to solvent-fractionation to obtain a n-butanol (BuOH) layer enriched with low molecular weight compounds, including flavonoids and hordatine derivatives. The BuOH layer was purified using ODS column chromatography. The isolated compound was structurally determined to be apigenin-6-C-glucosyl-7-O-glucoside (Saponarin) based on LC-ESI-QToF-MS and ^{1}H and ^{13}C NMR spectroscopy.

P3-25

Evaluation of the antioxidant and bone-forming activities of gomchwi extract and its application in edible films

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Jae Hu Lee, Areum Hwang, Mi Jeong Kim
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Gomchwi (*Ligularia fischeri*) is rich in bioactive compounds with antioxidant and bone-promoting activities. This study aimed to develop an edible film incorporating gomchwi extract as a functional food ingredient for the elderly. Extraction conditions were optimized using response surface methodology (RSM), and the extract's antioxidant and bone metabolic activities were assessed via cell-based assays. The optimal extraction condition was 50 °C, 25% ethanol, and 40 h. In MC3T3-E1 osteoblasts and RANKL-induced RAW 264.7 osteoclasts, the extract (100 μg/mL) enhanced ALP activity by 16% and reduced TRAP activity by 20% versus isoflavone controls. It also showed strong antioxidant capacity, with total phenolic content (TPC) of 54.92 mg GAE/g and flavonoid content (TFC) of 50.23 mg CE/g. The optimized extract was used to produce edible films, showing acceptable physicochemical properties. Moisture content increased with extract concentration, and disintegration time was significantly shortened at 0.25%. After simulated in vitro digestion, antioxidant activity was the highest during the intestinal phase. These findings support the potential of gomchwi extract as a multifunctional ingredient with antioxidant and bone health benefits, particularly in edible film applications for the elderly.

P3-26

Changes in lignans content of legumes consumed in Korea according to boiling

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Lignans, a group of phytoestrogens found in legumes and other plant-based foods, are known for their health benefits, including anti-cancer, anti-inflammatory, and cardiovascular protective effects. However, lignan content in legumes (36 samples) can be altered by cooking methods, particularly boiling, which is the most common method used in Korea. This study aims to investigate the changes in lignan levels in commonly consumed legumes in Korea following boiling. Six lignans (secoisolariciresinol, lariciresinol, matairesinol, pinoresinol, syringaresinol, and medioresinol) were quantified using liquid chromatography-tandem mass spectrometry. The highest lignan content among the legumes was found in raw red kidney beans (280 μg/100 g). However, boiling resulted in a nearly 60% reduction in total lignan content. Most legumes showed a significant decrease in lignan content after boiling, while lentils exhibited a 40% increase in lignan content after boiling. This study highlights the impact of boiling on lignan content in legumes commonly consumed by Koreans.

P3-27

Content of biotin in frequently consumed seafood in Korea

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This study investigated the biotin content in anchovy and edible seaweed commonly consumed in Korea using high-performance liquid chromatography. A total of 39 samples, including various sizes of raw anchovies and processed seaweed, were analyzed. Method validation for biotin quantification was performed in accordance with AOAC guidelines, including assessments of linearity, repeatability, and reproducibility. Among the anchovy samples, small raw anchovies from Area 2 had the highest biotin content at 3.990±0.022 μg/100 g, while broth made from large anchovies had the lowest level at 0.195±0.000 μg/100 g. In seaweeds, raw sea lettuce from Area 1 exhibited the highest biotin concentration at 9.351±0.029 μg/100 g, followed by dried sea mustard from Area 1 at 5.327±0.041 μg/100 g. The lowest biotin content among seaweed samples was observed in blanched seaweed fulvescens raw from Area 1, with a concentration of 0.321 ± 0.003 μg/100 g. Biotin levels generally decreased after soaking, blanching, or boiling processes. The validated HPLC method proved to be reliable and reproducible for the quantification of biotin in seafood and seaweed matrices. These results provide valuable data on the biotin content of anchovy and seaweed products in Korea and contribute to future dietary intake assessments of biotin.

P3-28

Simultaneous analysis of five chlorinated styrenes in low-fat food products

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The growing use of chemicals and their potential environmental release have raised concerns, especially regarding persistent, bioaccumulative, and toxic (PBT) substances. Among these, polychlorinated styrenes, especially octachlorostyrene, have been identified as substances of concern due to their high potential for bioaccumulation in the environment, leading to their designation as such by the National Industrial Chemicals Notification and Assessment Scheme in 1999. Furthermore, some monochlorostyrenes were selected for further investigation due to concerns regarding their environmental persistence and potential for bioaccumulation. This study developed a simultaneous analytical method for these five substances to facilitate proactive and preventive safety assessments of chlorinated styrenes. The analytical method was developed using GC-MS/MS, and validation was conducted with low-fat food as the matrix. For this purpose, one representative item was selected from each category of agricultural, livestock, and fishery products, namely carrots, chicken breast, and clams. Method validation is performed by obtaining LOD, LOQ, Accuracy, Precision, and Linearity. This research was supported by a grant(25192MFDS001) from the Ministry of Food and Drug Safety in 2025.

P3-29

Non-destructive discrimination of visually indistinguishable nutrient fortifiers using hyperspectral imaging

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The rapid growth of the functional food and dietary supplement industries has led to an increased utilization of nutrient fortifiers, such as vitamins. These additives are frequently produced in powder form, rendering them visually indistinguishable from one another. This raises concerns regarding consumer confusion, fraudulent labeling, and misuse, all of which undermine safety and public trust. This study sought to achieve non-destructive identification of visually similar fortifier powders through the application of hyperspectral imaging (HSI). The powders of L-ascorbic acid (Vitamin C), thiamine (Vitamin B1), taurine, pyridoxine hydrochloride (Vitamin B6), cholecalciferol (Vitamin D3), tocopherol (Vitamin E), and L-carnitine were analyzed for their spectral characteristics across the visible to near-infrared range (400-1000 nm) and the short-wave infrared range (1000-1700 nm). The classification model attained a notable improvement in accuracy from 89.04% (VIS-NIR) to 100% (SWIR), highlighting the superior discriminatory capacity of the SWIR spectrum. Overall, the integration of HSI technology presents significant potential to mitigate safety risks and economic impacts associated with fraudulent or misused food additives.

P3-30

Effect of cultivar, leaf maturity, sample preparation, and SPME fiber type on the volatile profile of fig (*Ficus carica* L.) leaves

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This study aimed to evaluate the effects of cultivar, leaf maturity, sample preparation, and solid-phase microextraction (SPME) fiber types on the volatile aroma compounds of Fig (*Ficus carica L.*) leaves. Two cultivars ('Masui Dauphine' and 'Longue d'Aout') were used, and the leaves were classified into young, intermediate, and mature stages based on size. Additionally, two pretreatment methods were applied: (1) physical treatment (cutting vs. ground with a mortar and pestle), and (2) freeze-drying vs. non-freeze-drying. Samples were analyzed by headspace GC-MS using four SPME fibers (PDMS, CAR/PDMS, DVB/PDMS, and DVB/CAR/PDMS). Among them, the DVB/CAR/PDMS fiber exhibited the highest extraction efficiency in terms of both the number of detected compounds and total peak area. The 'Masui Dauphine' exhibited the highest total peak area, especially in samples from intermediate leaves that were non-freeze-dried and ground with a mortar and pestle. On the other hand, the 'Longue d'Aout' showed less consistency across treatment conditions, indicating that more specific optimization strategies may be required depending on the intended use. These results provide practical guidance for selecting suitable conditions for the efficient extracting of volatile aroma compounds.

P3-31

Potential of natural cyclodextrans as digestive-resistant carriers: Comparison with cyclodextrins in structure and functionality

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In this study, the physicochemical, structural, and digestion characteristics of cyclodextrins (CDs) and cyclodextrans (CIs) were compared and contrasted using various analysis techniques. The results demonstrate that although CDs and CIs share some properties, such as solubilization rates, CIs are more resistant to digestion due to their higher degree of polymerization and more glycosidic linkages. Several analysis techniques, including FT-IR, XRD, DSC, TG, and NMR, were employed to investigate the presence of α-1,4 or -1,6 linkages in CDs and CIs and differences in their thermal characteristics. Furthermore, the glucose generation rate, in vitro simulated gastrointestinal digestion, and solubilization of poorly water-soluble compounds were examined, revealing that CIs offer better protection of the core material against harsh gastrointestinal conditions than CDs. Natural CIs and β-CD exhibit higher solubilization rates. These findings suggest that CIs and CDs have the potential as carriers for substances in food and medicinal fields.

P3-32

Simultaneous detection of glucose, lactate, and urea using a miniaturized multi-enzyme biosensor based on SWCNT/graphite/cobalt/chitosan nanocomposite

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There is a growing demand for next-generation biosensor technologies in the field of food quality and safety, driven by the need for accurate and real-time detection of key metabolites. In this study, we developed a high-sensitivity multi-enzyme biosensor capable of the simultaneous detection of glucose, lactic acid, and urea. The sensor is based on a composite matrix consisting of single-walled carbon nanotubes (SWCNTs), graphite, cobalt, and chitosan (GCC). For selective and efficient target recognition, glucose oxidase (Gox), lactate oxidase (Lox), and urease (Urs) were immobilized onto the SWCNT-GCC surface via a simple drop-coating and surface modification technique. This experiment enhances electron transfer and forms a robust catalytic interface. The fabricated biosensor demonstrates excellent stability, a wide linear detection range, and high reproducibility, confirming its applicability for real-world food analysis. Moreover, its miniaturized design and enzyme-specific activity make it well-suited for on-site detection in food storage and distribution settings. This study highlights the potential of the proposed multi-enzyme nanocomposite biosensor as a promising tool in the development of smart food logistics and quality monitoring systems.

P3-33

Analytical method development for the determination of dechlorane plus in livestock products by GC-HRMS

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Dechlorane Plus (DP) is a chlorinated flame retardant introduced in the 1970s as a replacement for the banned compound Mirex. Due to its extensive industrial use, DP has become widely distributed in the environment, exhibiting high persistence and bioaccumulative properties. Consequently, it has been detected in various environmental and food matrices, raising concerns about human exposure and potential adverse health effects. In this study, we investigated the concentration of DP which include syn-DP, anti-DP, Dec-602, Dec-603, and Dec-604 in livestock products using a developed simultaneous analytical method by gas chromatography-high resolution mass spectrometry (GC-HRMS). A method was developed for the determination of Dechlorane Plus (DP) in livestock products, employing Accelerated Solvent Extraction (ASE) for sample preparation, followed by multi-layer column chromatography for clean-up, and GC-HRMS for detection. The method was validated in accordance with CODEX guidelines by assessing selectivity, linearity, limits of detection (LOD) and quantification (LOQ), accuracy, and precision. Validation results demonstrated that the method complies with CODEX performance criteria, confirming its reliability and applicability for the quantification of DP in livestock products.

P3-34

Development of a QuEChERS-Based GC-MS/MS method for the determination of chlorinated styrenes in food

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Chemicals originated from industrial activities can persist in environment and migrate into the food chain, posing risks of human exposure. Among these, chlorinated styrenes (CSs) are unintentionally produced persistent, bioaccumulative, and toxic (PBT) substances. Despite their potential for food contamination, research on their presence in food and related risk management is limited, highlighting the need for foundational studies to support preventive food safety. This study developed an analytical method for determining five CS analytes-2-, 3-, 4-chlorostyrene, 2,6-dichlorostyrene, and octachlorostyrene—in various food samples. The method combines an optimized QuEChERS-based preparation with gas chromatography-tandem mass spectrometry (GC-MS/MS) for highly sensitive and selective detection. To overcome the challenges of applying QuEChERS to high-fat and complex food matrices, we systematically optimized the extraction solvent, sample amount and sorbent composition, effectively removing matrix interferences. It is expected to enable the accurate assessment of CS contamination in food, thereby supporting risk assessment and contributing to public health protection. This research was supported by a grant (25192MFDS001) from the Ministry of Food and Drug Safety in 2025.

P3-35

Analytical method development for quercetin and related flavonoids using LC-MS/MS

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Flavonoids such as quercetin, kaempferol, apigenin, and luteolin are widely present in plant-based foods and have gained attention due to their diverse biological activities. However, growing interest in their potential toxicity under high exposure conditions has highlighted the need for reliable analytical methods to support dietary intake assessment and toxicological evaluation. In this study, we developed and validated an LC-MS/MS method for the simultaneous determination of quercetin and three structurally related flavonoids in food. Three different food matrices were selected, and the sample pretreatment procedure was optimized using ultrasound- extraction Method validation included the assessment of linearity, sensitivity, recovery, and precision. The method showed excellent linearity ($R^2 > 0.99$) for all analytes, with limits of quantification (LOQs) ranging from 2.0 to 5.0 ng/g depending on the compound and matrix. Recoveries ranged from 87.5% to 107.3%, and relative standard deviations (RSDs) were below 5%, demonstrating high accuracy and reproducibility. This method provides a robust tool for the quantification of flavonoids in food and can be applied to dietary exposure studies and toxicological risk assessments. This research was supported by a grant (25192MFDS002) from the Ministry of Food and Drug Safety in 2025.

P3-36

Comparison of the quality of *Panax ginseng* and *Panax quinquefolium* : A sensometabolomics approach

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This study compared the sensory and metabolite characteristics of Panax ginseng and Panax quinquefolium using an integrated sensometabolomics approach. Quantitative descriptive analysis revealed that P. ginseng exhibited higher sweetness and terpene-like aroma, while P. quinquefolium showed stronger bitterness and astringency. Sugar and organic acid profiling indicated that P. ginseng contained a higher level of sucrose, which may contribute to its enhanced sweetness. In contrast, P. quinquefolium had more tartaric and oxalic acids, which may be potentially linked to its bitterness. Ginsenoside analysis showed greater levels of PPD-type ginsenosides (e.g., Rb1, Rc) in P. quinquefolium, whereas PPT-types (e.g., Rg1, Rf) were more abundant in P. ginseng. Volatile profiling revealed that P. ginseng was enriched with terpene compounds such as β-panansinsene and ginsinsene, contributing to a ginseng-like flavor perception. Correlation analysis suggested that sweetness and terpene-like notes were positively associated with sugars and PPT-type ginsenosides, while bitterness and astringency were related to organic acids and PPD-types. These findings highlight key metabolic traits that underlie sensory differentiation between the two ginseng species.

P3-37

Analytical method development and risk characterization for benzotriazole ultraviolet stabilizers in various foods

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In this study, an analytical approach was established and validated to measure benzotriazole ultraviolet stabilizers (BUVSs) in a variety of food items frequently consumed in South Korea. This work addresses the need for systematic surveillance of these emerging contaminants in food. The developed method, based on gas chromatography-mass spectrometry, exhibited strong performance in terms of selectivity, sensitivity, and reproducibility, achieving detection limits as low as 0.008-0.040 ng/g depending on the food matrix. Notably, higher concentrations of BUVSs were detected in lipid-rich samples such as beef, eel, and mackerel, particularly for compounds like UV-326, UV-327, and UV-328. Dietary exposure estimates, derived from Korean National Health and Nutrition Examination Survey (KNHANES) data, indicated that the average intake levels of these substances do not pose significant health risks, as the calculated margins of exposure were well above the safety benchmark value of 100. The findings highlight the need for continuous monitoring of persistent chemical pollutants in foods, especially those high in fat, to mitigate long-term bioaccumulation risks and support public health safety.

PART Ⅳ Food Microbiology, Fementation, and Safety

P4-01

Industry-applicable extraction conditions of red ginseng according to root sections and their storage stability

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Red ginseng contains unique saponins known as ginsenosides, which exhibit various pharmacological effects. During the heat processing of ginseng into red ginseng, major ginsenosides are transformed into minor ginsenosides, which have higher efficacy and bioavailability. This study investigated the extraction efficiency and storage stability of red ginseng root parts under different ethanol concentrations (0%, 5%, 10%, and 20%). Results showed that both higher ethanol concentration and longer extraction time increased total ginsenoside content. When comparing the main root and fine root, fine roots exhibited higher ginsenoside yields. Microbial stability was also evaluated at 25 °C, 35 °C, and 45 °C. The initial microbial count was higher in the main root extract (10^2-10^3 CFU/mL) than in the fine root extract (10^1 CFU/mL). During storage, microbial counts in the water extract increased to 10^8-10^{10} CFU/mL, whereas ethanol extracts remained similar to initial levels. Although ethanol inhibited most microbial growth, spore-forming bacteria such as Bacillus spp. were still detected. These results demonstrate that changes in main component content and microbial levels under different conditions may contribute to improving the quality of red ginseng products.

P4-02

Characterization and whole-genome analysis of *Lactobacillus brevis* IJRG101010 isolated from the Jinan plateau

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The Jinan plateau, characterized by lower average temperatures (1-2 °C below other regions) and reduced sunlight exposure, provides favorable conditions for the cultivation of ginseng. These unique climatic conditions contribute to a distinct microbial composition compared to other regions. From various environmental sources within the Jinan plateau, approximately 300 strains of lactic acid bacteria (LAB) were isolated. Among them, 31 strains were selected, and one strain demonstrated superior resistance to saponins present in ginseng, red ginseng, and black ginseng concentrates. This strain was identified and designated as Lactobacillus brevis IJRG101010. L. brevis is known for its heterolactic fermentation pathway, producing CO2 and acetic acid, suggesting its potential to enhance flavor and impart a refreshing sensory profile in fermented red ginseng products. Whole-genome sequencing of L. brevis IJRG101010 revealed a genome comprising six contigs with a total length of 2,458,343 bp. Notably, 173 genes were associated with in carbohydrate transport and metabolism. These findings indicate that L. brevis IJRG101010 has significant potential for improving fermentation technologies, particularly in the development of value-added functional ginseng products.

P4-03

Complete genome sequences of acetic acid-producing *Acetobacter pasteurianus* GYA23 (KACC 92385P)

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Acetobacter pasteurianus, an industrial strain widely used for vinegar production, exhibits various phenotypic differences related to respiratory activities, acetic acid tolerance, and heat resistance. In this study, we sequenced the complete genome of A. pasteurianus GYA23 to gain a deeper understanding of its genetic structure. The final assembly comprised a circular chromosome of 2,675,596 bp and eight plasmids ranging from 3,551 bp to 286,617 bp. Using GenDB software, we identified 2,421 protein-coding sequences (CDS) on the chromosome and 532 CDS on the plasmids, along with 57 tRNA genes and 15 rRNA genes. Genome-level phylogenetic analysis clarified the evolutionary position of A. pasteurianus within related taxonomic groups. A total of 2,953 coding DNA sequences were predicted, with approximately 75% assigned putative functions. The genomic data were further used for metabolic pathway analysis relevant to biotechnological substrates. Genome analysis revealed cooperative mechanisms contributing to acetate resistance, including Na+/H+ antiporter homologs functioning as K+/Na+ and Na+/H+ antiporters, which play critical roles in maintaining cation and pH homeostasis, thereby supporting growth at elevated temperatures. This genomic resource provides a valuable platform for future efforts to enhance acetic acid production in A. pasteurianus GYA23.

P4-04

Characteristics and bioactivities of bacteria from Uzbekistan honey

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Honey is a natural product made from floral nectar that is enzymatically processed and regurgitated by bees. During this process, sucrose is hydrolyzed into glucose and fructose, forming a viscous liquid with distinct physicochemical properties. Its high sugar content and antimicrobial enzymes provide excellent storage stability and various health benefits, including immune modulation and skin regeneration. This study evaluated the microbiological characteristics and physiological activities of four bacterial strains isolated from honey produced in Uzbekistan. Analyses included growth on various media, tolerance to high sugar levels, optimal pH, total polyphenol content, antioxidant activity, and anti-diabetic activity. All strains grew well on YPD, LB, and YPS media but only survived without proliferation in 70 Brix honey. Their optimal growth pH ranged from 5.6 to 10.6, and total polyphenol content averaged 2.6 mg/g. Among them, *Bacillus paralicheniformis* OY-2 showed the highest antioxidant activity. When cultured in YPD medium, it also demonstrated the strongest anti-diabetic effect, with 17.5% α-glucosidase inhibition. These results suggest that *B. paralicheniformis* OY-2 is a promising microbial candidate with antioxidant and anti-diabetic properties for food industry applications.

P4-05

Quality characteristics of black barley vinegar fermented with mixed acetic acid bacteria

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This study aimed to develop high-quality black barley vinegar using mixed cultures of acetic acid bacteria—GV12-8 (*Acetobacter pasteurianus* subsp. *ascendens* GV-12 and *A. pasteurianus* subsp. *ascendens* GV-8) and GV8-22 (*A. pasteurianus* subsp. *ascendens* GV-8 and *A. pasteurianus* GV-22)—and to evaluate their effects on vinegar quality. In both fermentation groups, ethanol was fully converted to acetic acid by day 10, with total acidity reaching 5%. Organic acids, particularly acetic acid, increased markedly. In contrast, total polyphenols declined, likely due to phenolic degradation or transformation. Similarly, free amino acids decreased, possibly because acetic acid bacteria utilized them as nitrogen sources. Aroma profiling revealed that GV12-8 vinegar had higher levels of volatile compounds than GV8-22. Notably, acetic acid, ethyl esters (contributing fruity and sweet notes), and 3-methylbutyl acetate (banana- and pear-like aroma) were significantly elevated in GV12-8. These results suggest that the GV12-8 bacterial combination is more effective in producing vinegar with superior aromatic and sensory qualities. Although further safety assessments are required, this approach can support the development of premium, functional fermented foods using domestic agricultural resources.

P4-06

Physicochemical and sensory properties of Makgeolli supplemented with brewer's yeast and hop varieties

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This study aimed to develop fruit-flavored *makgeolli* by incorporating *Humulus lupulus* (hop), which contributes a characteristic aroma. Various hop concentrations and processing methods were evaluated to optimize flavor. *Makgeolli* was prepared using rice, water, glucoamylase enzyme, yeast (*Saccharomyces cerevisiae* Safale WB06), and two hop varieties (Saaz and Hongchen). Fermentation involved a primary stage at 25°C for 6 days, a secondary stage at 35°C for 3 days, and aging at 10°C for 24 hours. Treatments A and C showed the highest levels of soluble solids (up to 18.90 °Brix) and reducing sugars (up to 20.65%). Alcohol content showed no consistent trend. Volatile compounds remained below 300 mg/L. No significant differences were found in pH, total acidity, or amino acid content among treatments. Various free sugars and organic acids were detected, reflecting complex fermentation dynamics. These results suggest that hop addition can enhance sugar content and sensory qualities in *makgeolli*. Further optimization of hop type and processing, along with exploration of fruit extracts and yeast strains, may support the development of more diverse and appealing *makgeolli* products.

P4-07

Volatile compounds related to bacterial contamination in microbial culture starters (nuruk)

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This study aimed to investigate the influence of bacterial presence on volatile compound profiles in *nuruk*, a microbial culture starter. Two *nuruk* samples were prepared: highly contaminated with bacteria (approximately 7 log CFU/g) and another with reduced bacterial levels (below 2 log CFU/g). Volatile compounds were analyzed using GC-MS, and statistical comparisons were performed using t-tests. The bacteria-contaminated *nuruk* exhibited significantly higher levels of undesirable volatiles, including 3-methylbutanal (15-fold increase) and 1-hexanol, a known off-flavor in plant-based foods (2.8-fold increase, $p < 0.05$). In contrast, the bacteria-reduced *nuruk* showed significantly higher levels of pleasant aroma compounds such as 3-octanone ($p < 0.05$), indicating that bacterial growth may suppress favorable aroma formation. Therefore, minimizing bacterial contamination during *nuruk* production is essential to enhance flavor quality and optimize fermentation characteristics.

P4-08

Surface disinfection in enclosed indoor environments using non-thermal atmospheric pressure plasma

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Effective control of pathogenic microorganisms on surfaces is essential for hygiene in food production and distribution environments. This study evaluated the inactivation of *Staphylococcus aureus* inoculated on glass surfaces using non-thermal atmospheric pressure plasma (NTAPP), with a focus on the effect of plasma duty ratio on reactive species generation and sterilization efficiency. A dielectric barrier discharge (DBD) plasma device was used, and major reactive species (O_3, OH, H_2O_2) were measured under different treatment conditions. As the duty ratio increased, the concentration of reactive species increased, resulting in shorter treatment times required to achieve a given level of bacterial reduction. When experimental conditions were adjusted to yield equivalent CT values (concentration × time), similar inactivation levels were observed at higher duty ratios. However, at lower duty ratios, bacterial inactivation was significantly reduced despite the same CT values, indicating that a minimum concentration of reactive species is required for effective sterilization. These findings suggest that both the CT value and the absolute concentration of reactive species are critical factors in plasma-based bacterial inactivation. NTAPP thus offers a controllable and effective method for improving microbial safety in food-related environments.

P4-09

Gut microbiota-modulating potential of a high-proportion α-1,6 linked glucan synthesized by bioconversion from maltodextrin

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The functionality of dietary polysaccharides in gut health is influenced by their digestibility, fermentability, and structural features. In this study, a glucan with dextran like structure was synthesized via bioconversion from maltodextrin using *Gluconobacter oxydans* (*G. oxydans*-derived α-glucan, GO-dex), and their structural and compositional characteristics how affect gut microbiota was assessed. GO-dex exhibited a higher proportion of α-1,6 glycosidic linkages compared to maltodextrin, along with a heterogeneous molecular weight profile comprising both high- and medium-molecular weight fraction. These features contributed to its resistance to enzymatic degradation in the upper gastrointestinal tract. We hypothesized that this structural attribute would allow GO-dex to reach the colon intact, where it could serve as a selective substrate for microbial fermentation. In vitro fecal fermentation of GO-dex resulted in enhanced production of short-chain fatty acids (SCFAs), with acetate as the predominant metabolite. Microbial profiling based on 16S rRNA gene amplicon sequencing analysis revealed compositional shifts associated with the GO-dex substrate, indicating its potential to beneficially modulate the gut microbiome. Overall, GO-dex demonstrates both structural resistance to digestion and biological functional prebiotic efficacy, supporting its application as a novel prebiotic dietary fiber for promoting intestinal health.

P4-10

Comparative analysis of fermentation properties of non-*Saccharomyces* yeast strains from traditional Korean fermented foods

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This study aims to comparatively analyze the fermentation characteristics of 23 non-*Saccharomyces* yeast strains isolated from traditional Korean fermented foods to identify promising yeast resources for industrial applications. All strains were cultivated in YPD medium for 24 hours, and their production of organic acids and volatile compounds was analyzed, with *Saccharomyces cerevisiae* as the control. According to the organic acid analysis, the maximum concentration was 6.7-fold higher than that produced by the control strain. *Wicherhamomyces anomalus* NR07 strain, which showed the highest organic acids production, notably produced substantial amounts of ascorbic acid and propionic acid. In the analysis of volatile compounds, Kluyveramyces marxianus KJ-L strain exhibited the highest levels of isoamyl alcohol, associated with banana-like aroma, and phenylethyl alcohol, indicating a rose-like aroma, which were 2.0 and 1.5-fold higher than those of the control strain, respectively. These findings demonstrate that non-*Saccharomyces* yeast strains can produce significantly higher levels of both organic acids and aroma compounds compared to the control strain, highlighting their potential as a fermentation starter to enhance the quality and sensory characteristics of fermented foods.

P4-11

천연소재추출물을 처리한 어리굴젓 내 위해 미생물 군집 제어

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어리굴젓은 굴을 양념과 함께 숙성시킨 한국 전통 발효식품으로, 높은 수분 함량과 비가열 제조 특성상 위해 미생물의 증식에 의한 품질 저하 가능성이 높다. 특히 발효 과정에서 발생할 수 있는 이미·이취 및 부패균 증식은 소비 기피 요인으로 작용하며, 산업적 유통 및 장기 보관에도 어려움을 초래한다. 본 연구에서는 어리굴젓 내 미생물 군집 변화 및 위해 미생물 출현 여부를 분석하고, 이를 제어할 수 있는 천연소재추출물 적용 가능성을 평가하고자 하였다. 이를 위하여 천연소재추출물 3종을 선택하여 어리굴젓 제조공정 상에 첨가 후 미생물 군집 변화를 측정하였다. 그 결과, 가장 높은 비율의 위해미생물 Staphylococcus가 천연소재추출물 미처리 대조군에 비해 천연소재추출물 처리군 1, 2에서 33%, 천연소재추출물 처리군 3에서 88%까지 감소하는 좋은 결과를 보였다. 결론적으로 미생물 군집 내 유해균을 높은 비율로 억제시키는 후보 물질을 발굴하였고, 이를 통해 장기 보관 가능성과 위생적 안정성 확보가 가능함을 확인하였다. 본 결과는 향후 전통 어패류 발효식품의 품질 표준화 및 산업적 상품화에 기여할 수 있을 것으로 기대된다.

P4-12

Optimization of culture conditions and quality evaluation of a synbiotic complex using hot water extract of *Oenanthe javanica* (Minari)

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This study aimed to optimize the culture conditions for enhancing probiotic viability and prebiotic efficacy in synbiotic formulations using hot water extract of *Oenanthe javanica (Minari)* as a prebiotic substrate in combination with Lacticaseibacillus rhamnosus L22-FR28 (KACC 92513P). Minari powder (1.0-4.0%) was extracted at temperatures (60°C and 100°C) for 1, 3, and 5 hours, inoculated with *L. rhamnosus* L22-FR28 at concentrations of 1.0-5.0%, and incubated for up to 48 hours, with bacterial growth evaluated by viable cell count. Optimal bacterial growth was achieved under the conditions of 2.0% Minari extract (60°C, 3 h), 2.5% inoculum level, and 24 h incubation, which resulted in a 1.8-fold increase in viable cell count compared to the control ($p < 0.05$). In contrast, 4.0% extract significantly inhibited bacterial viability, potentially due to elevated osmotic pressure or the accumulation of heat-labile polyphenolic compounds exhibiting antimicrobial activity. These results suggest that hot water extract of O. javanica is a promising prebiotic component, with potential use in developing functional synbiotic foods or beverages targeting gut health. The optimized parameters may serve as a foundation for developing synbiotic-based functional fermented foods.

P4-13

Changes in red ginseng ginsenosides during the Makgeolli fermentation process

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Makgeolli goes through alcoholic fermentation and lactic acid fermentation processes. Various components are converted through this fermentation process. Red ginseng has various ginsenoside components as functional components. Ginsenoside components have been studied to exhibit various functions as they are converted through biotransformation such as fermentation. In this study, red ginseng was added during the fermentation process for making makgeolli, and the conversion of red ginseng ginsenoside components by fermentation was confirmed. We plan to explore ways to utilize the functionality of converted ginsenosides in the future.

P4-14

Effect of added passion fruit peel juice on physicochemical properties of passion fruit wine

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Passiflora edulis (passion fruit) is a tropical and subtropical vine fruit rich in vitamin A, β-carotene, and various antioxidant compounds. While the pulp is commonly used for food, the peel is often discarded or used as livestock feed. This study aimed to enhance the utilization of passion fruit peel by adding peel juice into passion fruit wine and analyzing its effects on physicochemical properties and antioxidant activity. Compared to the pulp, peel juice exhibited higher pH (4.59), but lower total soluble solids (5.50 °Bx) and titratable acidity (1.90%). As the proportion of peel juice increased, ABTS radical scavenging activity significantly improved, reaching up to 2.7 times higher than the control. Vitamin C content ranged from 803.4 to 853.0 μg/mL depending on peel juice concentration. While β-carotene content gradually decreased, the level of isoorientin, a key antioxidant flavonoid, increased up to 1.9-fold. In addition, in treatments containing seed-inclusive pulp, isoorientin levels also increased with higher peel juice ratios. These findings suggest that passion fruit peel juice can be effectively utilized to improve the functional quality of fruit wine, offering potential for developing antioxidant-rich beverages and upcycling fruit by-products.

P4-15

Anti-inflammatory effect of fermented soybean products containing red ginseng from Jinan plateau and fermentation quality characteristics of isolated beneficial bacteria

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The saponin metabolome analysis results of Jinan red ginseng-added meju (Fermented Bean Block) and soybean paste showed that ginsenoside F1 and CK increased after fermentation. In addition, the anti-inflammatory evaluation results of red ginseng meju and soybean paste showed higher activity in red ginseng-fermented meju and soybean paste than in regular meju and soybean paste. In addition, 63 of Bacillus strains were isolated from traditional soybean paste of Jinan Plateau, and biogenic amine evaluation and enzyme activity were performed. The isolated strains are expected to improve the quality of soybean paste products when used as starters in meju production.

P4-16

Comparison of saccharification efficiency of Samgwang and Baromi2 floury rice under different enzymatic treatments

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Baromi2 is a floury rice belonging to Oryza sativa L.. Floury rice is generally more suitable for milling than non-floury rice. This study aimed to compare the saccharification efficiency of Baromi2 and Samgwang rice cultivars under different enzymatic treatments. Proximate compositions, including moisture, crude ash, protein, and crude fat, were analyzed to assess their potential influence on enzymatic hydrolysis efficiency. The starch granule morphology of Baromi2 and Samgwang was observed using scanning electron microscopy (SEM). After analyzing the characteristics of Baromi2 and Samgwang, the suitability of each rice type for saccharification was evaluated. Baromi2 produced higher reducing sugar content when individually treated with β-amylase, glucoamylase, or pullulanase. No significant difference was observed between Baromi2 and Samgwang under α-amylase treatment. Samgwang showed a greater increase in reducing sugars content over time treated with a mixture of commercial enzyme. The combination of α-amylase with two or more saccharifying enzymes resulted in the highest saccharification efficiency in both rice types. These results suggest that saccharified liquor from Baromi2 may be a promising substrate for alcoholic beverage production due to its high saccharification efficiency.

P4-17

Physicochemical changes in traditional Korean soy sauce according to the addition ratio of whey

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This study aimed to evaluate the effects of using whey as the brewing water in traditional Korean soy sauce, focusing on the reduction of the fermentation period, enhancement of umami flavor and functionality, and decrease in lactose content. As fermentation progressed, the pH decreased, while the total soluble solids content and titratable acidity increased with a higher ratio of whey addition. The total aerobic bacterial count rose from 3.33 to 4.42 log CFU/mL on day 0 and increased to 4.94 to 5.46 log CFU/mL on day 60, with the sample containing 100% whey exhibiting the lowest bacterial count. The total nitrogen content in the 100% whey sample exceeded 1.0% by day 20, while other samples reached this level after day 30, suggesting that the addition of whey may shorten the aging period. Although the lactose content increased with higher whey addition ratios, there was no significant difference among samples on day 60, with values ranging from 3.58 to 3.88 mg/mL. The free amino acid content increased with whey addition, with the 100% whey sample containing 16.66 mg/mL of glutamic acid. Additionally, the total polyphenol content, as well as DPPH and ABTS radical scavenging activities, increased proportionally with the whey addition ratio. This work was supported by Jeollannam-do, Korea ('2024 R&D supporting program' operated by Jeonnam Technopark).

P4-18

Fermentation characteristics and changes in antioxidant activity of whey fermented using Meju as a starter

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This study analyzed the amino nitrogen content and enzyme activity of meju to expand the applications of whey utilization. Additionally, it evaluated the reduction in lactose and the changes in antioxidant activity during whey fermentation, using meju as a starter. The amino nitrogen content and the activities of α-amylase, β-amylase, lipase, and protease in meju were determined to be 41.34-398.09 mg/100 g, 17.77-128.15 U/g, 3.80-16.64 U/g, 0.20-1.36 U/g, and 0.08-2.80 U/g, respectively. As fermentation progressed, the pH and total soluble solids content of the whey decreased, while titratable acidity and total aerobic bacterial counts increased. The total polyphenol content, total flavonoid content, and DPPH radical scavenging activity consistently increased throughout the fermentation period. The lactose concentration decreased from 45.68-48.88 mg/mL (day 0) to 4.18-6.40 mg/mL (day 12). Based on the strong correlation between amino acid content and enzyme activity, the amino acid content required to achieve a 50% reduction in lactose during whey fermentation was estimated to be at least 284.23 mg/100 g. This work was supported by Jeollannam-do, Korea ('2024 R&D supporting program' operated by Jeonnam Technopark).

P4-19

유청 첨가 단계에 따른 청국장의 품질특성 비교

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청국장은 삶은 콩에 고초균을 접종하여 발효시킨 대표적인 전통 발효식품으로 다양한 생리활성 기능을 가지며, 장 건강에 도움을 주는 다량의 미생물을 함유하고 있어 기능성 식품으로 주목받고 있다. 유청은 치즈 제조과정에서 발생하는 부산물로 단백질, 유당, 무기질 등이 풍부하여 활용가능성이 높으나, 대부분 폐기되고 있는 실정이다. 이에 본 연구는 청국장 제조과정 즉, 불림단계, 삶기단계 및 접종단계별로 액상 유청을 처리하여 품질이 향상된 청국장을 개발하고자 하였다. 불림단계에서의 유청 처리는 불림시 사용되는 물 대신 액상 유청에 침지하여 불림하였고, 삶기단계에서의 유청 처리는 삶는 물 대신 액상 유청을 첨가하여 콩을 삶았다. 미생물 접종 단계에서의 유청 처리는 기존 불림과 삶기 단계에서는 물로 처리해서 공정을 진행하였고, 고초균 접종시 멸균한 액상 유청을 분무하면서 접종하여 청국장으로 제조하였다. 연구결과 조단백질, 조회분, 조섬유, 아미노태 질소, ABTS, SOD 및 flavonoid에서 대조구 대비 유청첨가에 따른 유의적인 차이를 보이지 않았다. 그러나 적정산도와 pH에서 유청첨가구에서 차이를 보였으며, 당도에서 불림과 삶기단계에서 각각 0.70 °brix와 0.97 °brix로 가장 높게 나타났다. DPPH 라디칼 소거활성은 삶기단계 시료구가 57.38 EDA%로 가장 높았으며, 다음으로 불림단계 시료구가 56.36 EDA%로 높게 나타났다. 총 폴리페놀에서는 불림단계 시료구가 0.68 mg/mL로 가장 높게 나타났다. 따라서 청국장 제조단계에서의 유청은 항산화활성과 총 폴리페놀 함량 측면에서 유의적인 차이를 보이는 불림단계 시료구가 가장 우수한 것으로 나타났다.

P4-20

Comparative survey of Enoki mushrooms (*Flammulina filiformis*) in Korea: Microbial safety, packaging atmosphere, and volatile profiles

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Flammulina filiformis (enoki mushroom) is a highly perishable, high-moisture crop that is particularly vulnerable to microbial contamination. Recently, Korean enoki mushrooms have been implicated in multiple international food safety alerts, including *Listeria monocytogenes* outbreaks linked to exports to the United States resulting in serious illnesses and fatalities. This study conducted a comparative survey of enoki mushrooms from multiple anonymized Korean producers to assess microbial contamination, packaging gas composition, and volatile metabolite profiles. Samples were evaluated for *Listeria* and other pathogens, revealing that approximately half of the sampled companies showed high levels of pathogens. General spoilage indicators and in-pack O_2 and CO_2 levels upon arrival were also measured in the preliminary experiment, ranging from approximately 0-15% O_2 and 11-56% CO_2 across eight different companies. Thermal desorption GC-MS revealed largely similar VOC patterns among samples, though acetoin and possibly 3-octanone emerged as potential biomarkers for *Listeria*-infected mushrooms. These findings highlight the need for improved postharvest management to enhance microbial safety and quality consistency.

P4-21

Microbial community dynamics in sliced boiled pork (Pyeonyuk) during storage: A next-generation sequencing-based study

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Pyeonyuk (sliced boiled pork) is a traditional Korean meat product widely consumed for its savory flavor and texture. Due to its high moisture and protein content, it is prone to microbial spoilage during storage. In this study, we investigated microbial community shifts in *pyeonyuk* during refrigerated storage using next-generation sequencing (NGS). Samples stored at 4℃ for 0, 7, 14, 21, and 28 days were analyzed by extracting total DNA and amplifying the V3-V4 region of the 16S rRNA gene, followed by sequencing with the Illumina MiSeq platform. The results showed that microbial diversity gradually increased with storage time, with a marked increase observed between 14 and 21 days. Initially, the genera Macrococcus and Pseudomonas predominated during early storage, but as storage time progressed, microorganisms such as Enterobacterales, Yersiniaceae, Proteobacteria, Serratia, Fafniaceae, Rahnella, Lactobacillales, Ewingella, and Pantoea increased, which is expected to significantly impact the quality of *pyeonyuk*. These findings offer valuable insights into microbial quality monitoring and may contribute to the development of more accurate shelf-life guidelines for ready-to-eat meat products. This work was supported by the "Glocal University 30 Project at Jeonbuk National University" under the Jeonbuk state and Sunchang county.

P4-22

Characterization of lactic acid bacteria having antibacterial and potential probiotics activity isolated from traditional fermented foods

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Lactic acid bacteria isolated from traditional fermented foods (kimchi and soybean pastes) were selected on the basis of their broad spectrum antibacterial activity, safety, cell adhesion as well as resistance to acid, bile, temperature and examined for availability as a probiotic material. In order to estimate the potential risk of food poisoning, we investigated for antimicrobial activities of against foodborne pathogens and the production of harmful substance including indole, phenylpyruvic acid, β-glucuronidase, urease. Three strains selected based on antimicrobial activities results also showed notable cell adhesions activity. Selected strains identified L. *sakei* USG9-3, *L. paraplantarum* USW38-3, *L. pentosus* USW39-8 by the phylogenetic analysis based on 16S rRNA gene sequencing. Thus, the three *Lactobacillus* strains could be considered as potential antimicrobial probiotic strains against human pathogens and should be further studied for their human health benefits. This work was supported by the "Glocal University 30 Project at Jeonbuk National University" under the Jeonbuk state and Sunchang county.

P4-23

Potentional probiotic properties *Bacillus subtilis* isolated from traditional Korean soybean fermented products

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This study was conducted to isolate novel Bacillus subtilis strains from traditional Korean soybean fermented products for their potential application as food additives. To evaluate the applicability of the isolated strains, various physiological characteristics were assessed, including extracellular enzyme activity, acid resistance, bile resistance, and intestinal adhesion ability. As a result, five candidate strains were selected, among which strains SRCM130790, SRCM130800, and SRCM130826 exhibited superior physiological properties and were chosen for further analysis. Strains SRCM130790, SRCM130800, and SRCM130826 showed survival rates exceeding 50% at pH 2.0 and 71% in the presence of 0.3% oxgall, demonstrating strong acid and bile tolerance. Notably, the strains exhibited over 59% intestinal adhesion ability, indicating their suitability for food applications. These findings suggest that the selected Bacillus subtilis strains are promising candidates not only as food additives but also for various industrial applications in the probiotics industry. 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 2025.

P4-24

Impact of salt concentration on bacterial diversity and biogenic amines content in Ganjang

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In this study, the effect of the salt concentration in Ganjang on microbial diversity and biogenic amine production was analyzed. The salt concentration in Ganjang was found to have a statistically significant correlation with species richness and species abundance indices. Although the alpha-diversity index did not show a significant correlation with biogenic amine levels, an increase in salt concentration resulted in a statistically significant decrease in histamine and tyramine levels. An analysis of the correlation between microbial distribution and biogenic amines based on the salt concentration in Ganjang revealed that the distribution of Lactobacillus sp. and Bacteroides sp. increased as the salt concentration increased, while the levels of biogenic amines decreased. On the other hand, the distribution of Tetragenococcus sp., Chromohalobacter sp., and Halomonas sp. decreased with increasing salt concentration, accompanied by an increase in biogenic amine levels. 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 2025.

P4-25

Optimization of Cheonggukjang fermentation parameters based on functional and microbial safety evaluations

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This study aimed to establish a foundation for the standardization of Cheonggukjang fermentation by evaluating the quality characteristics and safety of three Bacillus species isolated from traditional Cheonggukjang products in Sunchang. Each strain was inoculated at concentrations of 0.5% and 1.0% and fermented for 48 hours. During fermentation, changes in total viable cell counts, microbial safety, moisture content, pH, amino-type nitrogen, and free amino acid contents were analyzed. No harmful microorganisms such as E. coli or B. cereus were detected under any fermentation condition, confirming the safety of all tested strains. Free amino acid profiling revealed that JSRB151 produced the highest levels of sweet- and bitter-tasting amino acids, while JSRB574 generated the highest umami-related amino acids. Additionally, JSRB291 resulted in the highest GABA content at 2.97 mg/L. The optimal condition was determined to be 1.0% inoculation and 48 hours of fermentation, providing a scientific basis for the production of standardized and functionally enhanced Cheonggukjang products. 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 2025.

P4-26

Comparative analysis of microbial communities in Kimchi collected from western, central, and eastern regions of Jeollabuk-do

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This study conducted a comparative analysis of the kimchi microbiomes collected from the western, central, and eastern regions of Jeollabuk-do, South Korea. According to the alpha-diversity analysis, the Shannon and Inverse Simpson indices were significantly higher in the western region than in the other regions, indicating a higher microbial diversity. Analysis of relative abundance of microbial communities at the phylum level in all samples collected from the Jeollabuk-do region revealed that Bacillota accounted for more than 90% of the total microbiota. At the genus level, lactic acid bacteria such as *Weissella, Leuconostoc*, and *Latilactobacillus* were identified as the dominant genera. Regional comparison revealed that *Weissella*, a halotolerant lactic acid bacterium, was predominant in the western region, while Leuconostoc was more dominant in the central and eastern regions. Biomarker analysis further indicated that members of the genus *Weissella* had the most significant impact on the variation in microbial community structures among the regions. The western region of Jeollabuk-do, adjacent to the West Sea and influenced by a marine climate, is characterized by salty sea breezes and high humidity, which are presumed to provide favorable conditions for the growth of halophilic microorganisms.

P4-27

Molecular weight distribution of poly(γ-glutamic acid) produced by *Bacillus* sp. FBL-2

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Poly(γ-glutamic acid) (γ-PGA) is a poly-amino acid that L-glutamic acid is connected by amide bonds, which is soluble, biodegradable and non-toxic compound. In this study, the molecular weights of γ-PGA produced by Bacillus sp. FBL-2 were examined. Carbon sources and nitrogen sources did not significantly affect the molecular weight of γ-PGA, and the concentrations of the optimal carbon source and nitrogen source also did not affect the molecular weight. L-Glutamic acid resulted in approximately 4,000 kDa of γ-PGA at 40 g/L, and citric acid led to low molecular weight of γ-PGA (2,786 kDa) when not added. The minerals such as CaCl2 and NaCl had no significant effects on cell growth, viscosity, γ-PGA production and molecular weight. However, MgCl2, at high concentrations, and MnCl2 was shown to inhibit γ-PGA production. KCl was shown to be a factor promoting γ-PGA synthesis. FeCl2, FeCl3, and ZnCl2 are found to be the factors that reduce the molecular weight of γ-PGA, since they resulted in 1,562 kDa, 1,424 kDa and 860 kDa of γ-PGA at 1.5 g/L, respectively. Since FeSO4, Fe2O12S3 and ZnSO4 also showed a similar tendency to FeCl2, FeCl3, and ZnCl2, Fe2+, Fe3+, and Zn2+ could be selected as the factors to control the molecular weight of γ-PGA when Bacillus sp. FBL-2 is used for γ-PGA production.

P4-28

Optimization of lactic acid fermentation using amylolytic lactic acid bacteria in vial culture

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Lactic acid is typically produced either by microbial fermentation or by chemical processes. In microbial fermentation, optically pure L(+)-lactic acid or D(-)-lactic acid can be produced, but in the chemical process, a racemic type (mixture of 50% L(+)-lactic acid and 50% D(-)-lactic acid) is produced. At this time, lactic acid with high purity having only one optical isomer is very important for industrial application of lactic acid. In biodegradable polymers, the higher the ratio of L(+)-lactic acid, the stronger the product's durability. We explored the optimization of fermentation conditions using 50 mL vials to increase the production of lactic acid. As a result of investigating the effect of different types of carbon and nitrogen sources on lactic acid production in vial culture, starch and glucose showed the highest lactic acid production among carbon sources, while tryptone resulted in the highest lactic acid production among nitrogen sources. Furthermore, the effect of tryptone concentration on lactic acid production was examined in vial culture. The results showed that lactic acid production increased with higher tryptone concentrations. Under the condition of 20 g/L starch and the highest tryptone concentration of 25 g/L, lactic acid production reached 7.89 g/L.

P4-29

The study on the optimal carbon source for lactic acid production by *Lactobacillus amylophilus*

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In the fermenter culture experiments, various pre-culture strategies and substrate concentrations were evaluated to optimize lactic acid production using *Lactobacillus amylophilus* B-4437. Pre-cultivation with starch alone resulted in a lactic acid production of 45.4 g/L, with a yield of 57% and a productivity of 0.58 g/L·h. When glucose was used for both the pre-culture and main culture stages ('glucose-glucose' condition), lactic acid production increased to 54.9 g/L, with a 63% yield but a lower productivity of 0.4 g/L·h. Interestingly, when glucose was used in the pre-culture and starch was used in the main culture ('glucose-starch' condition), the highest productivity of 0.61 g/L·h and lactic acid production of 55.2 g/L were achieved, with a yield of 59%. In an additional fermenter experiment using 100 g/L starch as the main carbon source and 25 g/L tryptone as the optimized nitrogen source, lactic acid production reached 41.4 g/L, with a 67% yield and a productivity of 0.34 g/L·h. These results suggest that the combination of glucose pre-culture followed by starch fermentation provides a balance of high lactic acid production and productivity, and that *L. amylophilus* B-4437 is well-suited for starch-based lactic acid fermentation under optimized conditions.

P4-30

Potential of *Lactococcus lactis* subsp. *cremoris* IMCCL013 as a functional ingredient for promoting bone health

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In aging societies, osteoporosis and age-related bone loss are becoming increasingly serious health concerns, highlighting the need for safe and natural interventions to support bone metabolism. This study investigated the potential of *Lactococcus lactis* subsp. cremoris IMCCL013 to promote bone health by evaluating its effects on osteoblast proliferation, differentiation, and mineralization using murine pre-osteoblastic MC3T3-E1 cells. The cell-free supernatant (CFS) of the strain was prepared through culture and centrifugation and applied to MC3T3-E1 cells at various concentrations. Cell proliferation was assessed using the MTT assay, and a significant increase was observed at a concentration of 500 μg/mL of CFS. Alkaline phosphatase (ALP) activity, an early marker of osteoblast differentiation, was significantly elevated in all treatment groups, with the highest level recorded at 500 μg/mL. In addition, Alizarin Red S staining confirmed increased calcium deposition at this concentration, indicating enhanced matrix mineralization. These results suggest that IMCCL013 may serve as a promising probiotic-derived functional ingredient for promoting bone health, particularly among the elderly population.

P4-31

Fermentation characteristics and immunomodulatory activity of persimmon vinegar produced by *Acetobacter pasteurianus* isolated from traditional Korean vinegar

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Acetobacter pasteurianus is an acetic acid bacterium(AAB) widely used in vinegar fermentation due to its high ethanol and acetic acid tolerance. It is a food-grade microorganism listed in the Korean Food Code for vinegar production. In this study, *A. pasteurianus* NFV04-10 and NFV04-11, isolated from traditional Korean vinegar, were used to produce persimmon vinegar. Their fermentation characteristics and immunomodulatory potential were evaluated. Both strains showed high tolerance to low pH and 6-9% (v/v) ethanol without acetic acid overoxidation or colloid formation. The resulting vinegar had a total acidity above 4% after 30 days of fermentation, meeting the vinegar quality standard. Residual ethanol remained at 1-2%, and methanol decreased over time to approximately 300 μg/mL. In addition, treatment of heat-killed *A. pasteurianus* (8 log CFU/mL) on RAW 264.7 cell significantly increased nitric oxide (NO) production, suggesting immunomodulatory activity. These results indicate that the isolated strains are suitable as starter cultures for high-quality vinegar production and have potential as functional food ingredients. This research was supported by a grant from the Korea Food Research Institute (E0211400-05) funded by the Ministry of Science and ICT, Republic of Korea.

P4-32

Optimized red ginseng fermentation by *Lactobacillus plantarum* SRCM102370 for increased ginsenoside production

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This study aimed to optimize the fermentation of red ginseng using *L. plantarum* SRCM102370, a probiotic strain with high β-glucosidase activity. Glucose, yeast extract, fermentation period, and temperature were selected as key variables with a significant impact on the efficiency of ginsenoside bioconversion. Based on these variables, a Box-Behnken design was applied to optimize their concentrations. The highest levels of ginsenosides Rg3 and Rg5 were observed under the conditions of 0.25 g glucose, 0 g yeast extract, 7 days of fermentation, and a temperature of 32.5°C. Analysis of metabolites before and after fermentation of the red ginseng probiotic solution showed that major ginsenosides such as Rg1, Rb1, and Re were effectively converted into rare ginsenosides including Rg3, Rg5, and Rk1 by *L. plantarum* SRCM102370. This enzymatic activity contributed to enhanced levels of bioactive compounds, and several metabolites characteristic of lactic acid bacteria fermentation were also detected. These findings suggest that probiotic fermentation of red ginseng is a promising strategy for enhancing its bioactivity and developing high-value functional products.

P4-33

Comparison of quality characteristics of square and circle Meju fermented with *Aspergillus oryzae* SRCM101975 and *Bacillus amyliquefaciens* SRCM101439

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This study investigated the quality characteristics of square meju(SM) and circle meju(CM) fermented with Aspergillus oryzae SRCM101975 and Bacillus amyliquefaciens SRCM101439 for up to 10 days. The viable cell counts increased in both samples as fermentation progressed. The pH and ammonia nitrogen (AN) content increased until day 7, followed by a decrease in both types of meju. Acidity remained relatively constant in SM, while it increased until day 7 in CM and then decreased. Protease activity was higher in CM, reaching its peak at 2,192 unit/g on day 7. Free sugar analysis showed similar trends in both samples. In SM, glucose content decreased until day 3 and then increased, whereas in CM it decreased until after surface drying and subsequently increased. Fructose content increased until day 3 in both samples and then decreased. Organic acid analysis showed a gradual decrease in citric acid and an increase in lactic acid as fermentation progressed, with CM exhibiting the highest lactic acid content (2,834.4 mg/100g) on day 10. Free amino acid analysis revealed similar trends in both samples, with glutamic acid content on day 7 being higher in SM (11,554.5 mg/kg) than in CM (9,390.1 mg/kg). These results suggest that CM fermented for up to 7 days exhibits superior quality characteristics, particularly in terms of protease activity and lactic acid production, indicating its potential suitability for doenjang production.

P4-34

Quality characteristics and physiological activities of strawberry (*Fragaria × ananassa*) vinegar using *Acetobacter pasteurianus* FFIC 0015 Isolated from Makgeolli

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Fermented Food Industry Support (FFIC)

The purpose of this study was to develop high value-added strawberry (*Fragaria × ananassa*) vinegar by fermenting strawberries with acetic acid bacteria (AAB). Four AAB strains were isolated from traditional fermented foods, and FFIC 0015 was selected for its high acetic acid production. Vinegars were prepared using *Acetobacter aceti* (AA) and *A. pasteurianus* FFIC 0015, and their quality and physiological properties were evaluated. The total acidity of FFIC 0015 reached 4.30% by day 23 of fermentation. It was showed that FFIC 0015 reached vinegar standard acidity (4.0%) faster than AA Furthermore, FFIC 0015 increased total organic acid content (7,773.43 mg/100g) compared to AA Total polyphenol contents and total flavonoid contents in FFIC 0015 were 111.48 mg/L and 6.55 mg/L, higher than AA. The DPPH activity of FFIC 0015 (56.16%) was higher than that of AA (54.63%), whereas the ABTS activity of AA (89.87%) was higher than that of FFIC 0015 (84.90%). Although AA showed stronger AGI activity, FFIC 0015 had greater pancreatic lipase inhibition (29.63%) and exhibited a higher ACE inhibitory activity(92.59%) at a 5-fold dilution. These results suggest that FFIC 0015 shortens fermentation time and enhances functional properties, making it a promising functional vinegar with added value.

P4-35

Quality characteristics and physiological activities of Marygold (*Calendula arvensis* L.) vinegars using *Acetobacter pasteurianus* FFIC 0007 isolated from traditional fermentation food

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Fermented Food Industry Support (FFIC)

This study was conducted to investigate the quality characteristics and physiological activity of marygold vinegar (MV) by using acetic acid bacteria (AAB) to shorten fermentation time. 9 AAB isolated from various fermentation foods were evaluated to acetic acid production. FFIC 0007 reached 4.38% acetic acid in day 7 of fermentation and was selected for high acetic acid production ability. MV made with *Acetobacter aceti* (AA) and FFIC 0007 were compared. FFIC 0007 MV reached 4.27% acidity, about twice that of *A. aceti* by day 9 of fermentation. Total phenolic contents (TPC) and total flavonoid contents (TFC) were higher in FFIC 0007 MV (40.01 mg/L and 31.83 mg/L) than AA vinegar (35.21 mg/L and 28.26 mg/L). Antioxidant activities (DPPH and ABTS) were 30.51% and 40.69% in FFIC 0007 MV. The α-glucosidase inhibition (AGI) activity of FFIC 0007 MV (71.85%) higher than AA(67.66%) in the 5-fold dilution. also, The angiotensin-converting enzyme (ACE) inhibition activity of FFIC 0007 MV was increased dose-dependently and were higher in FFIC 0007 MV. Morover, a significant increase in pancreatic lipase inhibition activity was 48.72% in FFIC 0007 MV, compared to 26.40% in AA vinegar. These results indicate that FFIC 0007 a good candidate to be a potential high quality marygold vinegar.

P4-36

Fermentation characteristics and functional potential of *Komagataeibacter europaeus* isolated from traditional Korean fermented vinegar for persimmon vinegar production

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Komagataeibacter europaeus is a widely used acetic acid bacteria in industrial vinegar production due to its strong ethanol oxidation ability and high tolerance to acetic acid. This study evaluated the fermentation suitability, immune-modulatory potential, and vinegar quality of two novel *K. europaeus* strains (A22-03 and P03-04) isolated from traditional Korean fermented vinegar. These strains showed no overoxidation or colloid formation and tolerated acidity, low pH, and high ethanol. Application of the strains to persimmon vinegar fermentation resulted in a total acidity exceeding 6% (w/v) and a residual ethanol content below 1% (v/v) after 30 days. Acetic acid levels were above 60 mg/mL, and other organic acids decreased over time. The viable cell count increased to 7 log CFU/mL. Heat-killed cells (8 log CFU/mL) enhanced nitric oxide production in RAW 264.7 macrophages, indicating immune-modulatory activity. These findings suggest that the novel strains are suitable for high-quality vinegar production and potential application as value-added functional resources. This research was supported by a grant from the Korea Food Research Institute (E0211400-05) funded by the Ministry of Science and ICT, Republic of Korea.

P4-37

Alcoholic fermentation characteristics of dried persimmons under different bench-scale fermentation temperatures

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This study investigated the effects of fermentation temperature (20℃ and 30℃) on the physicochemical properties, color stability, and alcohol content of bench-scale dried persimmon fermentation using *Saccharomyces cerevisiae* yeast. Results showed that fermenting the dried persimmon at 30℃ led to a faster conversion of sugars to alcohol, reaching the highest alcohol content (7.13%) by day 3, while fermentation at 20℃ peaked at 7.07% on day 6. The complete depletion of reducing sugars confirmed the end of fermentation. pH decreased sharply in the first two days, stabilizing thereafter, while acidity increased due to organic acid production, peaking at 0.42% (30℃) and 0.39% (20℃) on day 6. Color and turbidity changes reflected pigment degradation and sedimentation. At 30℃, increased lightness (L*), from 56.35 to 63.80 in the first 2 days, indicated improved clarity, while reductions in red (a*), from 4.99 to 0.94, and yellow (b*), from 33.01 to 23.51, suggested carotenoid breakdown. Fermentation at 20℃ exhibited a slower but similar pattern. These findings highlight the influence of fermentation temperature on dried persimmon wine quality, demonstrating that higher temperatures accelerate fermentation and clarification but may compromise color stability. Turbidity of the sample fermented at 30℃ and 20℃ both reduced from 45.25 to 29.59 and 29.84, respectively. This study provides valuable insights for optimizing fermentation conditions to enhance dried persimmon wine's sensory and functional attributes.

P4-38

Screening of arabinose-utilizing microorganisms and evaluation of enhanced high-value metabolite production via adaptive laboratory evolution

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Arabinose, the second most abundant pentose sugar after xylose in lignocellulosic biomass, holds great potential as a renewable carbon source. However, its industrial use remains limited, and developing robust microbial platforms for efficient arabinose conversion into high-value products remains a key challenge. This study focused on enhancing arabinose metabolism in non-conventional yeasts capable of utilizing arabinose. Among strains isolated from diverse environments, Wickerhamomyces anomalus CBS 5759—a yeast known for its versatile metabolism and tolerance to various stress conditions—showed superior arabinose consumption. Supplementing NAD□ in YPA medium led to a trend of increased arabinose utilization compared to standard conditions. Additionally, adaptive evolution is planned to improve the strain's metabolic efficiency further. This includes investigating enzyme activities, cofactor regeneration, and regulatory mechanisms that affect sugar uptake and fermentation. These results suggest that integrating efficient arabinose-metabolizing yeasts with targeted metabolic and cultivation strategies could enable sustainable production of bioethanol and various high-value biochemicals from underused carbon sources like arabinose.

P4-39

Evaluation of critical control point effectiveness in beverage manufacturing processes

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This study attempted to secure the microbiological safety of beverages by analyzing the critical control point(CCP) effectiveness in beverage manufacturing process. The samples used in this study were 2 kind of beverages(mixed beverage and fermented milk). Food samples were collected before and after CCP and environmental samples were collected form manufacturing process. Total aerobic bacteria and coliform bacteria were evaluated by Korean Food Code and food poisoning bacteria were tested by multiplex pathogenic detection PCR kit and VT1 & VT2 PCR detection kit. As a result of this study, total aerobic bacteria were detected at 0.2 ± 0.4 log CFU/g in final product of mixed beverage and not detected in final product of fermented milk. Coliform bacteria and foodborne pathogens were not detected in all samples. Taking these results together, it is judged that the effectiveness of CCP is secured in beverage manufacturing process. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P4-40

Evaluation of critical control point effectiveness in candy manufacturing process

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This study attempted to evaluate the effectiveness of critical control point(CCP) by analyzing the microbiological contamination in candy processing. Three types of candies were tested: Jelly stick, Yanggaeng, Compressed candy. Candy samples were collected before and after CCP and environmental samples were collected using the swab method. Total aerobic bacteria and coliform bacteria were tested according to the Korea Food Code and food poisoning bacteria were estimated using multiplex pathogenic detection PCR kit, and VT1 & VT2 detection PCR kit. As a result of this study, total aerobic bacterial were not detected after CCP in candy samples and detected in 15 of 37 environmental samples. Coliform bacteria were not detected after CCP in candy samples and were detected in one of 27 environmental samples. Food poisoning bacteria were not detected in all samples. This result indicated that the CCP effectiveness in candy manufacturing process was secured. However, it is judged that further microbiological safety management of worker and work environment hygiene is necessary. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P4-41

바실러스 균주 접종에 따른 검정콩 발효물의 품질특성

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최근 건강 기능성 식품에 대한 관심이 높아짐에 따라, 전통 발효식품인 청국장에 기능성 이 우수한 검정콩을 활용하고자 하였다. 따라서 본 연구에서는 청국장 제조에 사용되는 Bacillus 균주(GBA 59, GBA 161)를 검정콩 품종(빛나두, 새바람)에 접종하였을 때 발효물의 품질특성을 조사하였다. 품질특성으로는 아미노산성 질소, 암모니아성 질소, 아미노산 조성을 분석하였다. 그 결과 검정콩에 바실러스 균주(GBA 59, GBA 161)처리에 따른 발효물의 품질특성을 조사한 결과 GBA 59 균주로 '빛나두' 품종을 48시간 발효시켰을 때 아미노산성 질소 함량이 가장 높았으며, 암모니아성 질소 함량도 높은 것으로 나타났다. 바실러스 균주에 따른 아미노산 조성을 비교한 결과 함황아미노산 함량은 GBA 59번에서 높게 나타났으며, '빛나두' 품종의 검은콩 발효물에서 다소 높게 나타났다. 또한 GBA 59 균주로 발효한 검정콩에서는 단맛 및 구수한 맛을 내는 아미노산의 비율이 높았으며, 반면 GBA 161 균주로 발효한 검정콩에서는 구수한 맛을 나타내는 아미노산의 비율이 높게 나타났다. 이러한 결과를 바탕으로 바실러스 균주를 이용한 검정콩 청국장 제조에 관한 기초자료로 활용될 수 있을 것으로 판단된다.

P4-42

발효조건에 따른 바실러스 접종 콩 발효산물의 품질특성

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바실러스(*Bacillus*) 균주를 접종하여 제조한 청국장은 전통 방식보다 발효 속도가 빠르고, 위생적이며 품질 균일성이 높다는 장점이 있다. 본 연구에서는 청국장의 발효 품질 향상을 위한 핵심 요소를 분석하였다. 발효 전 불림 과정은 콩 내부까지 수분을 침투시켜 아미노산성 질소 함량을 증가시키며, 이는 발효도를 높이고 최종 품질 개선에 기여한다. 불림시간은 최소 12시간 이상이 적절한 것으로 나타났다. 발효온도와 시간은 발효산물의 냄새와 점질물 생성과 밀접한 관련이 있으며, 일반적으로 40℃ 전후의 온도에서 양호한 발효가 이루어진다. 발효 시간은 제품의 특성과 목적에 따라 유연하게 조절할 필요가 있다. 특히 *Bacillus amyloliquefaciens* GBA 161 균주는 온도에 민감하게 반응하므로, 30℃ 이상의 환경에서 접종해야 활성이 극대화된다. 또한 콩의 상태에 따라 액상형 또는 분말형 접종 방식의 선택이 중요하다. 산업체 현장적용을 위해서는 발효실 내부의 온·습도 관리 또한 품질 안정성 확보를 위해 필수적이며, 이를 위한 제어 기술이 필요할 것으로 판단된다.

P4-43

음나무 새순 당침액 첨가 콤부차의 이화학적 특성

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음나무(Kalopanax pictus Nakai) 새순을 당침 처리한 후 이를 활용하여 콤부차 발효음료를 제조하고, 발효 기간 동안의 이화학적 품질 특성 변화를 분석하였다. 그 결과, 발효 10일째에 산도가 가장 높게 나타났으며, 주요 유기산으로는 젖산과 초산이 고함량으로 함유되어 있음을 확인할 수 있었다. 이는 발효가 활발하게 진행되었음을 보여주는 결과로, 유산균 등 미생물의 활성이 뚜렷하게 나타났음을 확인할 수 있었다. 유리당의 변화를 살펴보면, 발효가 진행됨에 따라 초기에 첨가된 설탕이 과당과 포도당으로 분해되었고, 이와 동시에 만니톨과 같은 당알코올의 함량이 증가하였다. 이러한 변화는 미생물의 당 대사 과정에서 나타나는 전형적인 양상으로, 발효를 통해 당의 조성이 변화하고 새로운 대사산물이 생성된 것으로 판단된다. 또한, 발효 10일째에 총 페놀성 화합물 함량이 가장 높게 측정되었으며, 이에 따라 항산화 활성도 가장 우수한 결과를 보였다. 이는 발효가 음나무의 기능성 성분을 활성화시키는 데 긍정적인 역할을 하였음을 시사한다.

P4-44

Evaluation of critical control point effectiveness and improvement plan for fancy biscuit manufacturing process

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In this study, microbiological unsuitable cases among confectionery were investigated, and the effectiveness of critical control point (CCP) in confectionery was estimated to suggest improvement plan. As a result of the unsuitable data in confectionery, the highest unsuitable rate is 88.8% in fancy biscuits. Fancy biscuits are defined as biscuits decorated with cream and chocolate, etc. The analysis of manufacturing process, it was predicted to be contaminated by the cream and chocolate filling process after the heating process which is the CCP in biscuits manufacturing process. To verify this prediction, the microbial contamination was evaluated. The contamination of total aerobic bacterial before and after CCP, after cream filling, and final products was analyzed 7.0 ± 0.2, 0.4 ± 0.8, 2.2 ± 0.1, and 2.3 ± 0.1 log cfu/g, respectively. Coliform bacteria and food poisoning bacteria were not detected in all samples. The effectiveness of CCP was confirmed in fancy biscuits. Therefore, to ensure the microbiological safety of fancy biscuits, it is judged to establish appropriate standards for the transportation of cream, the cleaning and disinfection of storage tanks, and the management of cream usage cycles. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P4-45

FT-IR-based structural characterization and comparison of exopolysaccharides (EPS) derived from lactic acid bacteria fermentation

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A total of 288 lactic acid bacteria (LAB) strains maintained at the Food and Agricultural Products Research Institute were screened for exopolysaccharide (EPS) production. Strains forming mucoid halos on MRS agar supplemented with 10% sucrose after 48 hours of incubation at 37 °C were selected as EPS-producing candidates. Among the selected strains, representative EPS samples (pYSH1, pYSH2, pYSH3, and pYSH7), along with an unpurified sample (cYSH1), were subjected to Fourier-transform infrared spectroscopy (FT-IR) over the range of 4000-500 cm^{-1}. Integration of characteristic polysaccharide regions (1120-1150 cm^{-1} and 930-950 cm^{-1}) was performed to evaluate the compositional and structural diversity of EPS produced by each strain. The FT-IR spectra revealed that pYSH1 exhibited significantly higher integrated values (7.8 and 6.8 in the 1120-1150 cm^{-1} and 930-950 cm^{-1} regions, respectively), indicating the presence of highly branched and complex β-glucan and dextran structures. In contrast, pYSH2 showed moderate values (6.2 and 6.0), which are consistent with primarily linear or weakly branched galactan/β-glucan structures. Meanwhile, pYSH3 and pYSH7 exhibited notably lower integration values (2.0-2.3 and 1.7-1.9, respectively), suggesting simple homopolysaccharide or low-molecular-weight oligosaccharide compositions with limited structural complexity. A comparative analysis of EPS samples before and after purification (cYSH1 vs. pYSH1) demonstrated that purification led to a reduction in EPS yield to approximately 50%, according to FT-IR intensity. However, a 78% reduction in protein and impurity signals at 1600 cm^{-1} resulted in more than a twofold increase in EPS purity. This integrated approach—from strain screening to EPS purification and structural analysis—highlighted the superior functional and industrial potential of pYSH1 due to its high degree of branching and structural diversity. Nonetheless, it also confirmed that while purification significantly improves EPS purity, it is accompanied by a substantial loss in yield.

P4-46

Reduction of microbiological hazards in the production of dried laver

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The Korean dried laver industry has rapidly grown to hold over 70% of the global market. However, as exports increase, importing countries have strengthened regulations on microbial contamination. Nevertheless, existing studies on microbiological control in dried laver remain insufficient. This study evaluated two practical interventions UVC irradiation and ethanol spraying to reduce microbial loads during dried laver processing. Microbial monitoring was also conducted on processing water used in dried laver production. UVC (100W) treatment was applied for 30, 60, and 120 minutes. Ethanol spray was applied between the molding and dehydration processes at different concentrations. Total aerobic bacteria were reduced by 0.2 log CFU/g after 30 minutes of UVC treatment, and by approximately 0.7 log CFU/g after 60 and 120 minutes. No significant color changes were observed in any UVC treated samples. Ethanol spraying at 65-75% concentrations showed a dose-dependent reduction, achieving up to 1.4 log CFU/g reduction, with no statistically significant changes in color values. In the future, a combined treatment using UVC and ethanol is expected to effectively reduce microbiological hazards and may serve as a promising strategy to ensure food safety in the dried laver export industry.

P4-47

Evaluation of critical control point effectiveness in rice cake manufacturing process

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This study aimed to ensure the microbiological safety of rice cakes by analyzing the effectiveness of critical control point(CCP) in manufacturing process. Three types of rice cakes were tested: tteokguktteok, jeolpyeon, and injeolmi. Total aerobic bacteria and coliform bacteria were analyzed according to the Korean Food Code. Total aerobic bacteria decreased from 6.4 log cfu/g to not-detected in tteokguktteok, from 5.5 to 2.9 log cfu/g in jeolpyeon, and from 4.6 to 0.5 log cfu/g in injeolmi after CCP process. Coliform bacteria were detected at 1.5 log cfu/g in tteokguktteok and 3.3 log cfu/g in jeolpyeon before CCP but were not detected in all samples after CCP process. In final products, total aerobic bacteria were not detected in tteokguktteok but were found at 3.4 log cfu/g in jeolpyeon and 2.7 log cfu/g in injeolmi. Coliform bacteria were not detected in all final products and foodborne pathogens were not detected in all samples. As a result of this study, the CCP in rice cake manufacturing process is effective. However, total aerobic bacteria were detected in final products of jeolpyeon and injeolmi because side ingredients were added after CCP process. Therefore, it is determined that further microbiological safety management of these ingredients is necessary. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P4-48

Fermentation characterization of kimchi salted with deep sea water: role of *Leuconostoc mesenteroides* GS76 inoculum levels

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Deep sea water (DSW), collected from depths greater than 200 meters, is rich in minerals such as calcium, sodium, potassium, and magnesium, making it highly valuable in various industries including aquaculture, agriculture, cosmetics, and food production. Although DSW is regarded as clean, it is not suitable for direct consumption and requires desalination and mineral removal processes to ensure safety for human intake. In this study, kimchi was prepared using napa cabbage salted with DSW and inoculated with the strain Leuconostoc mesenteroides GS76, which was isolated from a DSW source. The samples were divided into a non-inoculated control group and groups inoculated at concentrations of 10^5, 10^7, 108and 10^9 CFU/g. Changes in microbial communities and fermentation characteristics in relation to inoculum levels were analyzed. Next-Generation Sequencing (NGS) was employed to examine microbial diversity and distribution throughout the fermentation period, revealing distinct dominant bacterial species during the early and late stages, depending on the inoculum levels. As fermentation progressed, significant differences in species richness, microbial diversity, and fermentation characteristics were observed among the samples.

P4-49

A study on the microorganism reduction according to the washing conditions of radish sprouts

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Radish sprouts are easily exposed to environments prone to cross-contamination from soil, agricultural water, and workers during cultivation and distribution, raising safety concerns due to high levels of bacterial contamination. This study evaluated the efficacy of physical (ultraviolet, ultrasonic) and chemical sterilization methods (alcohol, chlorine dioxide, sodium hypochlorite, citric acid, malic acid, and vinegar) for reducing Escherichia coli (E. coli), Staphylococcus aureus (S. aureus), and Bacillus cereus (B. cereus) on unwashed radish sprouts. Sterilization efficacy was assessed by plate counting after applying each method individually or in combination, and testing different concentrations. A 3% citric acid-malic acid mixture showed the highest microbial reduction. Treating unwashed sprouts with this mixture for 10 min reduced E. coli, S. aureus, and B. cereus to undetectable levels. Even after rinsing and storing at 4℃ for 4 days, no microbial growth was detected. However, quality of radish sprouts after sterilization declined significantly after one day of storage. Thus, to ensure safety, radish sprouts should be stored at 4℃, treated with the mixture for 10 min and rinsed before consumption.

P4-50

Eisenia bicyclis-mediated gold nanoparticles for combating bacterial growth and biofilm formation

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The emergence of multidrug-resistant and biofilm-forming pathogens has intensified the need for alternative antimicrobial strategies. In this study, gold nanoparticles (AuNPs) were synthesized using *Eisenia bicyclis* extract via a green chemistry approach. The resulting *E. bicyclis*-mediated AuNPs (EB-AuNPs) exhibited polyhedral morphology with an average size of 154.7 ± 33.5 nm and demonstrated potent antibacterial activity, particularly against *Staphylococcus aureus* and *Listeria monocytogenes*. At sub-minimum inhibitory concentrations, EB-AuNPs significantly inhibited biofilm formation by *Pseudomonas aeruginosa, Klebsiella pneumoniae, S. aureus,* and *L. monocytogenes.* They effectively eradicated mature *K. pneumoniae* biofilms. Furthermore, EB-AuNPs suppressed key virulence factors, including motility, protease activity, and pigment production, without exhibiting cytotoxic effects. These findings highlight the potential of *E. bicyclis*-mediated AuNPs as biocompatible agents to combat bacterial growth, biofilms, and associated virulence.

P4-51

Effect of fermentation temperature and acetic acid bacterial strains on bench-scale production of acetic acid from dried persimmons

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This study investigated the effects of fermentation temperature (20°C and 30°C) and five acetic acid bacterial sources—Mother Vinegar, an isolated strain, *Acetobacter aceti* KCTC 12290, *Gluconobacter oxydans* KCTC 2111, and *Acetobacter pasteurianus* KCTC 1008—on the physicochemical properties and color stability of dried persimmon vinegar fermentation. At 20°C, most strains showed limited alcohol-to-acetic acid conversion, with acidity stabilizing around 2.00% after 60 days, indicating slow fermentation. In contrast, at 30°C, Mother Vinegar, the isolated strain, and *A. aceti* achieved significantly higher acidity (7.15%, 5.46%, and 6.21%) within 24 days. The pH values decreased steadily at both temperatures, with *A. pasteurianus* maintaining more stable pH (3.75 to 3.46) and *A. aceti* showing the greatest decline (3.75 to 3.39). Brix values increased across all strains, reflecting limited sugar utilization. Color analysis revealed pronounced darkening (L* decrease) and increased red-yellow tones (a* and b* increase) at 30°C, especially in *A. aceti* and G. *oxydans*. At 20°C, *A. pasteurianus* maintained high lightness (87.47 to 91.58) and low a* values, indicating better color stability, whereas *A. aceti* and Mother Vinegar showed moderate lightness loss and increased yellowness (b*). These findings underscore the critical influence of temperature and microbial strain on vinegar quality and provide insights for optimizing fermentation processes to balance product quality and efficiency.

P4-52

Enzymatic synthesis of Rebaudioside M-Like compounds using UDP-glucosyltransferase and dextransucrase

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Rebaudioside M (RM), a steviol glycoside with superior sensory properties resembling sucrose and a reduced bitter aftertaste compared to stevioside (ST), has gained attention as a natural sweetener. Nevertheless, its poor aqueous solubility remains a major obstacle to broader industrial utilization. In this study, four novel steviol glycoside derivatives (RM1, RM2, RM3, RM4), structurally related to RM, were synthesized from two rebaudioside D-like compounds using UDP-glucosyltransferase and dextransucrase. Structural characterization was performed by LC-MS, ^{1}H-, ^{13}C-, and 2D-NMR. The novel steviol glycosides showed equal or enhanced stability under high-temperature and acidic conditions compared to ST. They also exhibited greater stability than ST when applied in a soft drink. Aqueous solubility tests revealed that RM1, RM2, RM3, and RM4 exhibited significantly improved solubility compared to RM, showing approximately 140-, 125-, 71-, and 80-fold increases, respectively. In addition, in vitro digestion assays showed that they released significantly less glucose compared to enzymatically modified stevia. These enhanced properties open new avenues for their industrial application, positioning them as next-generation sweeteners with significant commercial potential.

P4-53

Enzymatic synthesis of slow-digestible isomaltooligosaccharides and novel steviol glycosides using *Thermoanaerobacter thermocopriae* transglucosidase

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Transglucosidase derived from Thermoanerobacter thermocopriae (TtTG) is an enzyme known to catalyze transglycosylation reactions by hydrolyzing α-1,4 glycosidic bonds and transfer into α-1,6 glycosidic linkages. Isomaltooligosaccharides (IMOs) have been reported many studies to possess prebiotic effects. However, commercial IMOs predominantly contain oligosaccharides with a low degree of polymerization (DP≤4). Recently, some studies have shown that IMOs are hydrolyzed, leading to a rapid increase in blood glucose levels. Therefore, global companies are focusing their research 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 TtTG and 4,6-GT. And TtTG was evaluated for its potential as a transglycosylation enzyme using stevioside. TtTG generated IMOs up to DP 10 from α-1,4 substrates and up to DP 11 from α-1,6 substrates, whereas 4,6-GT showed lower activity and no reaction with α-1,6 linkages. And two novel glycosides were measured by a reaction using stevioside with TtTG. In conclusion, TtTG can produce high DP IMOs compared to 4,6-GT. This capability allows for the development of slow-digestible IMOs that overcome the limitations of commercial IMOs.

P4-54

Effect of purple corn cob (*Zea mays* L.) extract on fermentation characteristics of kombucha

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The cob of *Zea mays* L. is rich in anthocyanins and exhibits notable antioxidant and anticancer properties. However, despite its abundance of bioactive compounds, corncobs are often discarded as agricultural by-products. This study aimed to produce kombucha supplemented with *Zea mays* L. corncob extract (ZCE) and to evaluate its quality characteristics during fermentation. Kombucha was prepared using green tea, black tea, unrefined sugar, SCOBY, and ZCE at concentrations of 0.1%, 0.2%, 0.3%, 0.4%, and 1%. During fermentation, soluble solid content, pH, color, and total anthocyanin content were measured. The Soluble solid content decreased during early fermentation period but increased after day 8, with the 1% ZCE group showing the highest value. The pH gradually declined during fermentation, with ZCE-added groups showing significantly lower pH compared to the control. The L* value increased in ZCE-added groups, while a* and b* values increased in both control and ZCE-added groups. Anthocyanin content increased with increasing ZCE concentration, reaching a maximum of 32.80 mg/mL in 1% group, and remained stable during fermentation. These results suggest that ZCE enhances the functional properties of kombucha and may serve as a high-value ingredient for food upcycling applications.

P4-55

Quality characteristics of Shine Muscat fermented wine and distilled liquor using rice syrup as a sweetening agentd

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The alcoholic beverage market has shown growing demand for differentiated, health-oriented fermented products beyond conventional fruit wines. This study aims to develop value-added alcoholic beverages by combining Shine Muscat, known for its high sugar content, complex aroma, and storage stability, with rice syrup, a traditional maltose-based sweetener produced via natural saccharification. Rice syrup provides both viscosity and fermentable sugar functionality, making it a potential alternative to refined sugar. The complementary characteristics of Shine Muscat and rice syrup enable the development of fermented products with unique sensory attributes and traditional appeal. Fermentation was conducted using Saccharomyces cerevisiae NY-21, which demonstrated efficient sugar utilization in preliminary trials. Key analyses included sugar consumption, ethanol yield, organic acid profile, pH, and volatile aroma compounds. The fermented liquid was subjected to vacuum distillation to produce distilled liquor, and changes in physicochemical and sensory properties were evaluated. This study offers foundational data for the application of Shine Muscat and rice syrup in the development of novel traditional-style alcoholic beverages.

P4-56

Safety assessment of apple by-products for industrial upcycling

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A considerable number of apples are discarded during production and distribution due to thinning, fruit drop, and quality degradation. Additionally, large volumes of apple pomace (AP) are generated during processing. Thinned apples and AP are considered promising upcycling materials due to the large amounts in which they are generated and their abundance of functional compounds. However, safety evaluations essential for industrial utilization remain limited. This study assessed the microbiological and chemical safety of these apple by-products for potential industrial applications. In thinned apples, no mycotoxins (total aflatoxins and patulin) were detected, and heavy metals such as cadmium (0.002 mg/kg) and lead (0.010 mg/kg) were within the safety limits established by the Ministry of Food and Drug Safety. Of the 650 pesticide residues tested, 11 compounds, including dithiocarbamates (0.894 mg/kg) and fluazinam (0.189 mg/kg), were detected, all within the maximum residue limits (MRLs). Microbiological analysis of AP showed that bacterial counts exceeded safety limits on day 2 of storage at room temperature, while Escherichia coli and coliforms were not detected during the 4-day period. These findings provide foundational data to support the safe industrial use of apple by-products.

P4-57

강낭콩 발효액에 의한 *Fusarium oxysporum*의 균사 및 포자 억제를 통한 항진균 메커니즘 연구

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*Fusarium oxysporum*은 뿌리를 통해 감염하여 식품 원재료 및 가공식품의 저장 과정에서 부패를 가속화시키고, 독소 생성을 통해 식품 안전성에도 심각한 위협을 줄 수 있는 대표적인 토양전염성 사상균 병원체이다. 특히 토마토, 바나나 등 주요 식재료는 *F. oxysporum* 감염에 의해 저장 중 상품성과 소비기한 단축, 유통 중 손실을 일으켜 경제적 손실을 초래한다. 이에 따라 화학적 살균제를 대체할 수 있는 천연 항진균 물질의 개발이 절실하다. 본 연구에서는 강낭콩 추출물을 *Bacillus subtilis*로 발효시켜 얻은 발효액이 *F. oxysporum*의 균사 생장 및 포자 발아에 미치는 영향을 분석하였다. 발효에 사용된 B. subtilis는 곰팡이 세포벽 성분을 탄소원으로 활용하고 이를 분해하는 효소를 생산함으로써 생물학적 제제로 작용할 수 있다. 그 결과, 강낭콩 발효 추출물 200 μg/mL 처리 시 PDA 및 PDB 배지에서 *F. oxysporum*의 균사 및 포자 성장이 유의하게 억제되었으며, 이는 내성 발생 우려가 낮은 천연 항진균제로서의 가능성을 시사한다. 본 연구는 저장 식품의 곰팡이 오염을 제어하기 위한 생물학적 방제 수단으로 강낭콩 발효 추출물의 응용 가능성을 제시한다.

P4-58

Fermentation characteristics and antioxidant changes in mealworms (*Tenebrio molitor*) using commercial lactic acid bacteria starters

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Mealworms are a crucial food source that can help meet the growing global population's food demand due to their nutritional, industrial, and environmental benefits. While most research has focused on mealworm incorporation into food products, limited exploration of fermentation technology exists. Lactic acid fermentation enhances mealworms' functionality, flavor, and physical properties, increasing consumer preference. This study examined mealworms inoculated with commercial lactic acid bacteria starters (ABY-3, FLORA DANICA, ST-BODY-1, TCC-4, and YC-380). TCC-4 fermentation showed a high lactic acid bacteria count up to day five. Analysis confirmed nitrogen consumption and protein hydrolysis by lactic acid bacteria. The YC-380 fermentation had the lowest reduction in crude fat. Total polyphenol and flavonoid content increased with inoculation, with flavonoid content rising more than polyphenol content. DPPH and ABTS radical scavenging activities correlated with crude fat, while SOD-like activity correlated with amino acid nitrogen. These findings indicate that lactic acid bacteria fermentation, especially with TCC-4, can enhance the nutritional and functional value of mealworms, positively affecting their biochemical composition and sensory attributes. This work was supported by Jeollannam-do, Korea ('2024 R&D supporting program' operated by Jeonnam Technopark).

P4-59

Synergetic effect of alcoholic fermentation by *Saccharomyces cerevisiae* and *Wickerhamomyces anomalus* and acetic acid fermentation by *Komagataeibacter kakiaceti* P6 for improving apple vinegar quality

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This study aimed to enhance the quality of apple vinegar by improving its flavor through mixed fermentation using *Saccharomyces cerevisiae* W3 and *Wickerhamomyces anomalus* JK04, followed by acetic acid fermentation with *Komagataeibacter kakiaceti* P6. Safety evaluation via genomic and phenotypic analyses confirmed *that K. kakiaceti* P6 lacks toxic or antibiotic-resistant genes and displays food-safe traits. Alcoholic fermentation effectively converted apple juice sugars to ethanol under both single- and mixed-yeast conditions. Acetic acid fermentation trials revealed that vinegar fermented with K. kakiaceti P6 had superior acid production (pH 3.12±0.01 and total acidity 5.38±0.00%) compared to that fermented by the control strain, *Acetobacter pasteurianus* KACC 17058. Mixed fermentation resulted in significantly higher phenolic and flavonoid contents and enhanced antioxidant activity (DPPH and FRAP). Volatile compound analysis revealed increased fruity and floral esters and higher alcohols. Long-chain esters and phenolic compounds, such as phenethyl acetate and 2,4-di-tert-butylphenol, also increased, improving the sensory and functional qualities. This strategy shows promise for the development of high-value functional vinegars.

P4-60

Induction and physiological characterization of viable but non-culturable (VBNC) *Salmonella* induced by sanitizer treatment

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Chlorine-based sanitizers are commonly used in the fresh produce industry. However, sublethal levels of chlorine can induce viable but non-culturable (VBNC) *Salmonella*, leading to an underestimation of its contamination. This study aimed to induce the VBNC state of *Salmonella* under sodium hypochlorite treatment and to characterize its physiological changes. For induction of VBNC state, S. Enteritidis and S. Typhimurium were exposed to sodium hypochlorite solutions containing 5, 10, 50, and 100 mg/L free chlorine (FC) for 1 min. VBNC induction was confirmed by the loss of culturability on TSA plate while maintaining viability as assessed by the LIVE/DEAD BacLight kit. Morphological changes were observed using transmission electron microscopy (TEM). The enzymatic activities were measured using API ZYM kit and intracellular ATP levels were quantified using the BacTiter-Glo kit. VBNC induction of both S. Enteritidis and S. Typhimurium was observed under treatment of chlorine containing 50mg/L FC. VBNC cells of both S. Enteritidis and S. Typhimurium exhibited a ~40% reduction in cell size compared to vegetative cells. ATP production of VBNC cells induced by 50mg/L FC was still above 105 RLU threshold, whereas catalase and esterase activities declined after 50mg/L FC chlorine treatment. These results provide novel insights into the VBNC physiology of *Salmonella* under chlorine stress and underscore the importance of improved detection and mitigation strategies in food safety systems.

P4-61

Domain-specific characterization of the phage endolysin targeting *Bacillus licheniformis* for food safety

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Bacillus licheniformis is a major food spoilage bacterium, posing challenges to food safety. To control this bacterium, phage-encoded endolysins have drawn attention as potential antimicrobials. In this study, we identified a gene encoding a putative endolysin from the genome of *B. licheniformis*-infecting phage PS1, designated LysPS1. Sequence analysis revealed that LysPS1 consists of a single enzymatically active domain (GH25) at the N-terminal and two LysM-type cell binding domains at the C-terminal. LysPS1 effectively lysed *B. licheniformis* cells, demonstrating its antimicrobial potential. To explore each domain's function, the domains were expressed and purified separately. The GH25 domain alone exhibited antibacterial activity, though its lytic efficacy was lower than the full-length LysPS1, suggesting possible synergy with the binding domains. The LysM domains were expressed fused to green fluorescent protein, and their binding affinity to *B. licheniformis* will be evaluated in future studies. This study highlights the potential of LysPS1 and emphasizes the importance of domain-level characterization. These findings would provide insight for engineering endolysins with improved antimicrobial activity and target specificity for potential application in the food industry.

P4-62

Isolation and characterization of *Listeria monocytogenes*-specific bacteriophage vB_LmoP_KFSLM5, and optimization of phage propagation

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Listeria monocytogenes (LM) is a highly adaptable bacterial strain thriving in diverse environments. Using bacteriophages to kill LM is a feasible alternative to antibiotics and disinfectants. This study aimed to isolate and characterize an LM-specific phage, vB_LmoP_KFSLM5, and optimize its propagation conditions for high titers. The phage was isolated from sewage and purified. Its specificity against 55 bacterial strains was investigated by dot assay, and its morphology was observed by transmission electron microscopy. For high titers, phage propagation was compared at 30°C and 37°C, and also compared at a multiplicity of infection (MOI) of 0.0001-10. The purified phage reached a concentration of 2.5×1011 PFU/mL and exhibited lytic activity against LM. Its head diameters and tail lengths were 65.02 ± 7.78 nm and 393.69 ± 97.90 nm, respectively. Genomic analyses revealed that vB_LmoP_KFSLM5 consisted of 37,618 bp with 35% G+C content. In total, 63 ORFs were predicted in the whole phage genome. It had a latent period of 30 min and a burst size of 0.0027 PFU/CFU. The optimal temperature and MOI of vB_LmoP_KFSLM5 were determined to be 37°C and 0.01, respectively. This study successfully characterized vB_LmoP_KFSLM5 and effectively maximized phage yield through optimization.

PART V Nutritional, Bioactive and Functional Property

P5-01

Evaluation of the physiological activities of different parts of *Spinacia oleracea* L.

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Spinach is an annual or biennial plant in the Amaranthaceae family, rich in vitamins, minerals, and antioxidants. Its high folate content supports brain development, while lutein and zeaxanthin alleviate oxidative stress and support vision. Potassium contributes to blood pressure regulation and cardiovascular health. Additional benefits include reducing inflammation, preventing osteoporosis, and promoting skin and scalp health. In this study, ethanol extracts were prepared from the leaves, red basal part, and roots of Pohang spinach. Total polyphenol content, antioxidant activities (DPPH, ABTS, nitrite scavenging, and reducing power), anti-diabetic activity (α-glucosidase inhibition), anti-coagulant activity, and hemolytic safety were evaluated. The leaf extract had the highest polyphenol content (9.8 mg/g), followed by the red basal part (4.8 mg/g) and root (2.7 mg/g). The leaf extract showed strong DPPH, ABTS scavenging, and reducing power, while the red basal and root parts showed over twice the nitrite scavenging activity. No significant anticoagulant activity was observed. α-glucosidase inhibition was 13.5%, 11.0%, and 10.2% for leaf, red basal part, and root, respectively. Hemolytic activity was absent in leaf and red basal extracts up to 10 mg/ml, but the root extract was hemolytic at higher concentrations. These results suggest the potential of Pohang spinach extracts as functional food ingredients.

P5-02

Analysis of physiological activity of edible naturalized plants

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Humulus saponicus, Erigeron annus, Oxalis corymbosa and *Ambrosia tripida* are naturalized plants that have spread throughout Korea. In this study, antioxidant activity and skin whitening activity were measured to increase the utilization of naturalized plants that can eat young leaves. As a result of measuring the total polyphenol content of naturalized plant extracts, *Humulus japonicus* extract showed 32.57 mg/g, *Erigeron annuus* extract showed 242.66 mg/g, *Oxalis corymbosa* extract showed 24.29 mg/g, and *Ambrosia trifida* extract showed 32.57 mg/g. The electron donating ability and ABTS radical scavenging activity results showed that the antioxidant ability tended to increase in proportion to the total polyphenol content of the extracts in both experiments. As a result of measuring the inhibitory activity against xanthine oxidase, *Erigeron annuus, Oxalis corymbosa*, and *Ambrosia trifida* extracts showed activities of 79.86%, 59.08%, and 68.00%, respectively, at a concentration of 1,000 μg/ml. Therefore, *Erigeron annus*, *Oxalis corymbosa*, and *Ambrosia trifida* are thought to be available as antioxidant and gout-relieving functional food materials.

P5-03

Anti-obesity effect of beneficial bacteria and harmful components in ethanol extract from korean traditional *Cheonggukjang*

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This study investigated the effect of the content of beneficial bacteria and harmful components on the functionality of domestic Korean traditional *Cheonggukjang*. The *Cheonggukjang* was freeze-dried and extracted with ethanol. After removing the extraction solvent, the freeze-dried powder was evaluated for its anti-obesity effects (pancreatic lipase inhibition, inhibition of adipogenesis in 3T3-L1 preadipocytes). At the highest concentration of 10 mg/mL, the pancreatic lipase inhibition of *Cheonggukjang* extract showed 24.34~74.79%. Additionally, TFC24-1 exhibited the highest activity of 74.79%. The cell viability of 3T3-L1 cells treated with *Cheonggukjang* extract was maintained above 90% at concentrations up to 0.3 mg/mL. Lipid accumulation (%) decreased in a concentration-dependent manner with treatment of *Cheonggukjang* extract, and at the highest treatment concentration of 0.3 mg/mL, the reductions were 36.47~69.24%, and leptin production the highest treatment concentration of 0.3 mg/mL was 280.00~591.43 pg/mL. These results confirm that beneficial microorganisms and harmful substances did not significantly impact the anti-obesity effects of the *Cheonggukjang* extracts studied.

P5-04

Effect of beneficial bacteria and harmful components of traditional Korean *Gochujang* on the antioxidant and anti-inflammatory effects

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This study investigated the effects of beneficial bacteria and harmful components of domestic traditional Gochujang on the antioxidant activity and anti-inflammatory effects. The freeze-dried *Gochujang* were extracted with ethanol, freeze-dried and powdered. The *Gochujang* extract powder was evaluated for antioxidant activity (DPPH and ORAC) and anti-inflammatory effects (Raw 264.7 cells). The DPPH radical scavenging activity was 7.26%~28.34% at the highest concentration of 10 mg/mL, with TMG24-12 showing the highest activity at 28.34%. The oxygen radical absorbance capacity (ORAC) was expressed as mg Trolox equivalent (mg TE/g), with TMG24-12 was the highest at 21.16 mg TE/g. The amount of nitric oxide (NO) decreased in a concentration-dependent manner, showing 25.78~28.91 μM at the highest concentration of 0.4 mg/mL. The TNF-α and IL-1β production showed 22.32~30.62 ng/mL and 12.29~31.57 pg/mL at the highest concentration of 0.4 mg/mL, respectively. These results confirm that beneficial microorganisms and harmful substances in the Gochujang extract did not significantly affect the antioxidant activity and anti-inflammatory effects.

P5-05

Improving bioactivities of sorghum and Italian millet through household cooking methods

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This study evaluated the effects household thermal processing, steaming, pressure rice cooking, and roasting, on the bioactivities of sorghum and Italian millet, focusing on non-alcoholic fatty liver disease (NAFLD)-related functions. In sorghum, pressure rice cooking yielded the highest phenolic (110.90 mg GAE/g) and flavonoid (46.83 mg CE/g) contents, while both pressure rice cooking and steaming improved antioxidant activity. However, steaming showed the strongest NAFLD-related functionality, with the highest lipase inhibition (35.66%) and reduced lipid accumulation in HepG2 cells (84.67%) under free fatty acid-induced conditions. In Italian millet, which showed lower baseline activity, steaming was the most effective across all assays, increasing phenolic content (to 26.16 mg GAE/g), lipase inhibition (to 9.70%) and reducing lipid accumulation (to 94.15%). Thermal treatments enhanced functional properties alongside increased levels of bioactive compounds such as arginine, branched-chain amino acids, and sulfur-containing amino acids, known to support hepatic lipid metabolism. These findings suggest that simple steaming can improve the metabolic health potential of cereal grains and support their use as functional ingredients for NAFLD prevention.

P5-06

Characteristics of probiotics from coastal environments in the islands

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Islands are known to have high levels of endemism, meaning that their geographical isolation allows unique species to evolve and thrive. This study was conducted to investigate the characteristics of lactic acid bacteria (LAB) strains isolated from island regions with these unique characteristics. Lactobacillus are well-established probiotic strains with proven health benefits and are symbiotic microorganisms naturally present in the human gastrointestinal tract. In addition, microbial enzymes produced by probiotics are more valuable for manufacturing than other enzymes due to their diverse catalytic activities and high yields. The objective of this study was to evaluate the potential probiotic properties of LAB isolated from fermented vegetables. We isolated a total of 44 strains of LAB from island coastal environments, and the enzyme production ability of six digestive enzymes was evaluated for the isolated strains. Among the total LAB strains, one strain producing three digestive enzymes was identified. Next, we evaluated the antibacterial activity of 44 strains isolated using six strains representing food poisoning bacteria. As a result, 2 strains were identified that inhibit the growth of 4 or more types of food poisoning strains. In conclusion, these strains are expected to have high potential as probiotic strains for use in the food industry. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Project, funded by Korea Ministry of Environment (MOE) (grant number RS-2023-00230403) and Honam National Institute of Biological Resources (HNIBR) (Project No. HNIBR202502102), funded by the Ministry of Environment (MOE) of the Republic of Korea.

P5-07

Ishige okamurae extract suppresses osteoclastogenesis in RANKL-induced bone marrow-derived macrophages and ovariectomized mouse model

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Uncontrolled bone resorption induced by osteoclastogenesis can lead to bone diseases such as osteoporosis. Natural products are gaining attention as alternatives to antiresorptive agents such as bisphosphonates because they induce few side effects. This study investigated the effect of *Ishige okamurae* extract (IOE) on (i) receptor activator of nuclear factor kappa B (NF-κB) ligand (RANKL)-mediated osteoclastogenesis in bone marrow-derived macrophages (BMMs) and (ii) ovariectomy-induced bone loss in mice. IOE significantly reduced the number of tartrate-resistant acid phosphatase (TRAP)-positive multinuclear giant cells in RANKL-induced BMMs. It also inhibited RANKL-induced osteoclast-related factors, such as ACP5, calcitonin receptor, cathepsin K, and matrix metalloproteinase-9, and transcriptional factors, such as nuclear factor of activated T cells and cytoplasmic 1 and c-Fos. Moreover, IOE treatment blocked the activation of upstream mitogen-activated protein kinase and NF-κB cascades. 3D X-ray microscopy demonstrated that the administration of 50 and 200 mg/kg of IOE significantly altered osteoclast-related parameters such as the trabecular thickness, number, volume, and separation. Overall, these findings indicate that IOE can prevent osteoporosis caused by excessive osteoclast activity, thereby exhibiting potential for development as a functional food.

P5-08

Evaluation of the physiological activities of plants belonging to the genus *Cyperus*

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This study evaluated the physiological activities of four Cyperus species to determine their potential as functional food ingredients. Ethanol (95%) and hot water extracts were prepared from *Cyperus glomeratus* L. (aerial and root parts), *Cyperus difformis* (aerial part), *Cyperus pacificus* (Ohwi) Ohwi (whole plant), and *Cyperus microiria* Steud. (aerial part). Total polyphenol content was measured, and antioxidant activity was evaluated using DPPH, ABTS, nitrite scavenging, and reducing power assays. Antidiabetic activity was assessed via α-glucosidase inhibition, and anticoagulant activity was tested through TT, PT, and aPTT assays. Hemolytic activity was examined using human red blood cells to assess cytotoxicity. The results showed that all extracts had high polyphenol content and strong antioxidant activity. *C. glomeratus* and *C. pacificus* exhibited notable anticoagulant activity, while *C. difformis* demonstrated strong α-glucosidase inhibition. No hemolytic activity was observed in any extract, indicating favorable safety. These findings suggest the potential applicability of *Cyperus* species as functional food ingredients.

P5-09

Anti-coagulant, antioxidant and anti-diabetic activities of unripe apple salt

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Unripe apples contain about ten times more polyphenols than ripe apples, exhibiting strong antioxidant activity. These properties make unripe apples a promising ingredient for reducing fat absorption and promoting weight loss. Salt is essential for electrolyte balance, nerve signaling, muscle function, and flavor enhancement. In this study, unripe apple salt was created by mixing unripe apple powder extract with salt, followed by evaporation. The bioactive properties of unripe apple salt and sea salt were evaluated. The sea salt extract showed undetectable polyphenol levels (~0.4 mg/g), while unripe apple salt extract contained 1.4 mg/g. Antioxidant tests revealed that unripe apple salt showed higher DPPH, ABTS, nitrite scavenging, and reducing power than sea salt. For anti-coagulant activity, unripe apple salt showed TT, PT, and aPTT values of 0.87-, 1.79-, and 1.43-fold, respectively, outperforming sea salt at 0.83-, 1.42-, and 1.07-fold. Regarding anti-diabetic activity, at 0.5 mg/mL, unripe apple salt inhibited α-glucosidase by 9.4%, higher than sea salt (7.2%) but lower than acarbose (74.6%). In conclusion, unripe apple salt exhibited enhanced antioxidant, anti-coagulant, and anti-diabetic activities compared to sea salt, suggesting its potential as a functional food ingredient for reducing oxidative stress, improving coagulation balance, and controlling postprandial hyperglycemia.

P5-10

Computational screening of marine algal polyphenols for promoting muscle growth: An in silico molecular docking approach

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Skeletal muscle plays a vital role in energy metabolism, mobility, and physical performance. While synthetic supplements and drugs have been developed to enhance muscle growth prevent muscle loss, their use is often limited due to adverse side effects. As a natural and safer alternative, marine brown algae offer a promising source of bioactive polyphenols with potential muscle-protective and anabolic properties. In this study, we employed in silico molecular docking to evaluate the functional potential of phlorotannins derived from edible brown algae. Among the tested compounds, dieckol and 2,7'-phloroglucinol-6,6"-bieckol from *Ecklonia cava (E. cava)* exhibited strong binding affinity to myostatin and the IGF-1 receptor - key negative and positive regulators of muscle growth, respectively. In parallel, diphlorethohydroxycarmalol from *Ishige okamurae (I. okamurae)* showed the highest docking affinity for tumor necrosis factor-alpha (TNF-α), a central mediator of inflammatory myopathy. These findings highlight the potential of marine algal polyphenols as multifunctional agents that can both stimulate muscle growth and mitigate inflammation-induced muscle damage. Such compounds may serve as natural, functional alternatives to synthetic drugs for maintaining muscle health and preventing inflammatory myopathy. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Project, funded by Korea Ministry of Environment (MOE) (grant number RS-2023-00230403) and Honam National Institute of Biological Resources (HNIBR) (Project No. HNIBR202302113), funded by the Ministry of Environment (MOE) of the Republic of Korea.

P5-11

네트워크 약리학 및 멀티오믹스 기반 기억력 개선 기능성식품 연구 동향 분석

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기억력 손상은 경미한 인지기능 저하부터 신경퇴행성 질환에 이르기까지 다양한 양상을 보이며, 다중 표적 중재 전략이 필요한 전 세계적 보건 문제이다. 기능성식품은 생리활성 화합물을 통해 생리학적 경로를 조절하여 기억력 기능을 보존하는 비약물학적 접근법으로 주목받고 있다. 본 연구는 기억력 손상 예방을 위한 기능성식품 반응성 바이오마커의 발굴, 평가, 임상 적용을 위한 통합적 프레임워크를 제시하고자 한다. 뇌척수액 내 아밀로이드-β 및 타우 단백질, 신경영상 지표, 기억력 평가와 같은 기존 임상 바이오마커뿐만 아니라, 사이토카인, 마이크로RNA, 장내 미생물 시그니처, 후성유전학적 변화, 신경활성 대사체와 같은 영양 반응성 신규 마커들을 종합적으로 검토하였다. 시스템 생물학적 접근법을 활용하여 네트워크 약리학, 장-뇌 축 조절, 멀티오믹스 통합이 기능성식품 성분과 기억력 관련 경로 간의 복잡한 상호작용을 어떻게 규명할 수 있는지 탐구하였다. 특히 신경염증, 산화스트레스, 시냅스 가소성, 대사 조절과 같은 기억력 관련 핵심 경로들의 네트워크 분석을 통해 기존의 개별 바이오마커 중심 평가 체계의 한계를 극복할 수 있는 방안을 모색하였다. 연구 동향 분석 결과, 해외에서는 이미 기능성식품의 제형화 및 표준화부터 규제 프레임워크 및 임상 개발에 이르는 전 과정에서 정밀영양학 전략과 다학제적 통합 접근법을 적극 도입하고 있는 것으로 나타났다. 특히 기존 연구 결과를 메타 분석하여 새로운 바이오마커를 개발하고, 개인별 오믹스 프로파일을 활용한 맞춤형 영양 중재 전략이 활발히 연구되고 있다. 이러한 연구 동향을 바탕으로 향후 기억력 개선 기능성식품 연구에 적용할 수 있는 방향을 제시하였다. 첫째, 네트워크 약리학을 통한 다중 표적 상호작용 분석 체계, 둘째, 장내 미생물과 뇌 기능 연결 고리를 고려한 장-뇌 축 평가 방법론, 셋째, 멀티오믹스 데이터 통합을 통한 개인 맞춤형 바이오마커 발굴 등이다. 본 연구에서 분석한 최신 연구 동향은 기억력 건강 중재에 있어서 패러다임 전환을 제안한다. 기능성식품을 예방적 기억력 기능 프레임워크 내에서 개인 맞춤형 영양을 위한 과학적으로 검증된 접근법으로 위치시킴으로써, 향후 관련 연구 분야의 과학적 기반 강화에 기여할 수 있을 것으로 기대된다. (본 연구는 2025년도 식품의약품안전처의 연구개발비(24192영양안068)로 수행되었으며 이에 감사드립니다.)

P5-12

Impacts of extrusion pretreatment on rice bran arabinoxylan: physico-chemical, composition and structural change

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Rice bran (RB) is a valuable source of arabinoxylan (AX), a dietary fiber with promising prebiotic properties. However, RB contains more insoluble fibers like cellulose, limiting fermentability and gut microbial accessibility. To enhance its functional potential, strategies that improve AX solubility are needed. This study evaluated how extrusion pretreatment affects the composition and structure of alkali-soluble AX extracted from hexane-defatted (HD) and screw-defatted plus extruded (SD-EX) RB. In the alkaline extracts, arabinose and xylose were most abundant, with no significant differences in sugar profiles between treatments. Arabinose-to-xylose ratios were 1.19 (HD) and 1.13 (SD-EX). AX from extruded RB showed a broader molecular weight distribution, suggesting partial depolymerization likely caused by extrusion. Glycosidic linkage patterns were also comparable, with T-Araf, 4-Xylp, and 2,3,4-Xylp as the most abundant linkages. While AX content remained largely unchanged, extrusion enhanced solubility and modified molecular structure, which may improve fermentability and gut accessibility. Further fermentation studies are needed to confirm these outcomes. Additionally, extrusion provides a solvent-free, continuous processing advantage for AX modification.

P5-13

Ameliorative effects of *Sigesbeckia pubescens* Makino on atopic dermatitis-like lesions through JAK2/STAT pathway modulation

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Sigesbeckia pubescens Makino (SP) is a traditional herbal plant widely used in Korea and China to treat inflammatory diseases, and has also been consumed as a part of folk remedies in the form of herbal teas and decoctions, indicating its potential use as an edible functional material. In this study, we examined the anti-atopic and anti-inflammatory effects of SP extract (SPE) and its underlying mechanisms, focusing on its potential application as a functional food ingredient. Oral administration of SPE significantly improved atopic dermatitis (AD)-like symptoms in NC/Nga mice sensitized with house dust mite extract. This improvement included decreased epidermal thickness, reduced mast cell infiltration, suppressed serum inflammatory cytokines, and restoration of skin barrier integrity. In vitro assays using human epidermal keratinocytes (HEKs) and human dermal fibroblasts (HDFs) stimulated with interferon-γ (IFN-γ) and tumor necrosis factor-α (TNF-α) revealed that SPE inhibited pro-inflammatory chemokine production by regulating the JAK2/STAT1/STAT3 signaling pathway. These results suggest that SPE possesses significant anti-inflammatory and skin-protective properties and could be utilized as a promising food-derived bioactive compound for the development of functional foods aimed at alleviating inflammatory skin conditions such as atopic dermatitis. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Project, funded by Korea Ministry of Environment (MOE) (grant number RS-2023-00230403) and Honam National Institute of Biological Resources (HNIBR) (Project No. HNIBR202302113), funded by the Ministry of Environment (MOE) of the Republic of Korea.

P5-14

Hair growth effect and the mechanisms of *Rosa rugosa* extract in HFDPC and DHT-induced alopecia mice model

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Rosa rugosa is a medicinal plant known for its potential anti-inflammatory, antioxidant, anti-cancer, and antimicrobial benefits. The pharmacological effects of *Rosa rugosa* extract on hair loss have not yet been documented. This research sought to assess the inhibitory effects and mechanisms of action of *Rosa rugosa* water extract (RWE) in Human Follicle Dermal Papilla Cells(HFPDCs) and dihydrotestosterone (DHT)-induced alopecia mouse model. In this study, we found that RWE remarkably inhibited the production of Dickkopf-1(DKK-1), a main factor in the regression of hair follicles. Moreover, the STW significantly increased the cell viability of ultraviolet(UVB)-stimulated HFDPCs and decreased intracellular reactive oxygen species(ROS) production in oxidative stress models. In addition, the study was conducted using C57BL/6 mice, which were assigned to five groups: control, DHT-treated, *Rosa rugosa* water extract (RWE) at doses of 25 mg/kg and 100 mg/kg body weight, and bicalutamide-treated. To induce hair loss, dihydrotestosterone (1 mg/day per body weight) was administered via intraperitoneal injections, and dorsal hair removal was timed to align with the telogen phase. We assessed hair growth activity, examined histological changes, and performed Western blot analysis. We noted improvements in hair length and thickness. Additionally, the protein expression of growth factors associated with hair growth, including vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), and insulin-like growth factor-1 (IGF-1), showed significant increases in the group treated with RWE. Additionally, treatment with RWE suppressed the protein expression of hair growth inhibitory factors, including dickkopf WNT signaling pathway inhibitor 1 (DKK1) and interleukin (IL)-6. Moreover, hair growth regulatory pathway related factors, including ERK, AKT, and GSK-3β, were activated. These findings indicate that RWE could serve as a promising natural therapy for preventing hair loss by enhancing the production of factors that promote hair growth while inhibiting those that suppress it. Acknowledgements: This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Program(or Project), funded by Korea Ministry of Environment (MOE)(grant number RS-2023-00230403). This work was supported by the Honam National Institute of Biological Resources (HNIBR202302113), funded by the Korea Ministry of Environment (MOE).

P5-15

Antioxidant and anti-inflammatory effects of ginseng sprouts cultivated with fermented kelp

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Ginseng (*Panax ginseng*) sprouts (GS) have emerged as a valuable functional crop due to their shorter cultivation cycle and high bioactive compound content. In this study, we investigated the biological activities of GS hydroponically cultivated using a nutrient solution containing fermented kelp (FK), derived from *Laminaria japonica* fermented with *Saccharomyces cerevisiae*. The antioxidant effects were quantified by evaluating total phenolic content (TPC), total flavonoid content (TFC), and radical scavenging activity via DPPH and ABTS+ assays. A clear dose-dependent enhancement in antioxidant capacity was observed. To assess anti-inflammatory activity, LPS-induced RAW 264.7 macrophages were treated with GS extracts. The extracts markedly suppressed the production of inflammatory cytokines (IL-1β, IL-6, and TNF-α) as determined by ELISA. Moreover, the expression of iNOS and COX-2 was significantly downregulated, alongside reduced phosphorylation of MAPKs and decreased nuclear levels of AP-1 subunits (c-FOS and c-JUN), suggesting attenuation of AP-1-mediated signaling. These findings indicate that GS cultivated with FK possess potent antioxidant and anti-inflammatory properties, underscoring their potential utility as functional food ingredients. This work was supported by the Korea Institute of Marine Science & Technology Promotion (KIMST) funded by the Ministry of Oceans and Fisheries, Korea (20220473).

P5-16

Effects of *Crepidiastrum sonchifolium* fermented with *Saccharomyces boulardii* on the antioxidant and angiotensin-converting enzyme inhibitory activity on angiotensin II-induced stress

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Crepidiastrum sonchifolium (CS), a member of the Asteraceae family, is traditionally used for its anti-inflammatory, hepatoprotective, cardiovascular, and anticancer properties. In this study, CS hot water extract was fermented using *Saccharomyces cerevisiae, Saccharomyces boulardii*, and *Lactobacillus plantarum*. Fermentation with *S. boulardii* (CSF) was selected based on its superior ACE inhibitory activity and economic feasibility of industrialization. CSF showed enhanced antioxidant activity via total polyphenol and flavonoid content, and free radical scavenging assays (DPPH and ABTS+). To examine its cardiovascular protective effect, Angiotensin II (Ang II)-stimulated cardiomyocytes were treated with CSF at non-toxic concentrations. CSF suppressed Ang II-induced NADPH oxidase activity, which is linked to oxidative stress and hypertension. These findings suggest that CS fermentation with *S. boulardii* enhances antioxidant and ACE inhibitory activities, offering potential as a functional food or therapeutic agent for cardiovascular health. This work was supported by the Jeollanam-do Agricultural Research & Extension Service and Suncheon City Agriculture Development & Technology Center.

P5-17

Sageretia theezans ameliorates inflammation in PMA-induced A549 cells via the AKT/STAT1 and MAPKs pathway

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Sageretia thea is a shrub from the family Rhamnaceae, native to southern China. *Sageretia theezans* (ST) is one of the classic medicines in ancient times, which is commonly used to treat acute and chronic pharyngitis, lacquer sores, secondary infection of hemorrhoids, Tonsillitis, and other symptoms. However, the specific mechanism is still not entirely understood. This study aimed to explore the therapeutic effect and underlying molecular mechanisms of Extract of ST (EST) on PMA-induced A549 cells. A549 cells and PMA were used to develop inflammatory cell models. The secreted amounts of inflammatory cytokines were measured by enzyme-linked immunosorbent assay kits. Protein expression levels were measured by western blotting analyses. We performed a systematic analysis of the anti-inflammatory mechanisms of EST in PMA-treated A549 cells. EST considerably reduced the levels of TNF-α, and IL-6, IL-8 secreted by PMA-treated cells. EST treatment significantly inhibited phosphorylation of AKT/STAT1 and MAPKs. Our results indicated that EST ameliorated PMA-induced by inhibiting the inflammatory response and maintaining the respiratory health function via modulation of MAPKs and AKT/STAT1 pathways, thus, EST might be a promising therapeutic candidate for respiratory inflammatory therapy. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Project, funded by Korea Ministry of Environment (MOE) (grant number RS-2023-00230403) and Honam National Institute of Biological Resources (HNIBR) (Project No. HNIBR202302113), funded by the Ministry of Environment (MOE) of the Republic of Korea.

P5-18

Development of technology to evaluate the efficacy of liquid-phase administration of useful biological resources based on *Drosophila melanogaster*

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Recently, there has been an increasing demand for the development of animal-replacement research technologies based on the 3R principle; therefore, active research is being conducted in this area. Researchers have conducted studies evaluating the efficacy of useful biological resources using the *Drosophila melanogaster (D. melanogaster)* model through various methods, including feed mixing, solid-form administration, and paper filter administration. However, the development of standardized liquid-phase administration efficacy evaluation technologies for useful biological resources in *D. melanogaster* is minimal. Accordingly, this study aimed to develop standardized liquid-phase administration efficacy evaluation technologies and procedures for useful biological resources using *D. melanogaster*. *D. melanogaster* was raised at 25℃ (temperature), 60% (relative humidity), and a 12:12 h light-dark cycle, and the food was regularly replaced with fresh food every 2-3 days. For experiments and culture, mating was performed at a specific ratio of males and females (1:1 or 2:1), and adult flies were reared by separating the sexes from the first day. A standardized method for evaluating the efficacy of liquid administration in *D. melanogaster* was established through multiple validations. The established experimental method consists of steps 1 to 3, and proceeds in the order of intake, concentration setting, and efficacy evaluation. In this study, steps 1 and 2 were completed, and step 3 is scheduled for future implementation. 3-5 day old adult flies were fasted for 4 h in a 1% agarose vial and then transferred to a vial prepared for liquid administration. Useful biological resources were administered in liquid form using a pipette for 4 h. In step 1, it was confirmed that males and females consumed the liquid form of useful biological resources without death. After confirming the intake of liquid forms of useful biological resources, a total of four exposure groups were assigned using the same method as in step 1, and 40 males and females were exposed in each group. After liquid administration, the daily survival trends of all flies were monitored for 45 days, and behavioral changes, mortality rates, and other relevant data were recorded and calculated. This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Project to make multi-ministerial national biological research resources more advanced Project, funded by Korea Ministry of Environment (MOE) (Grant number RS-2023-00230403) and Honam National Institute of Biological Resources (HNIBR) (Project No. HNIBR202502102), funded by the Ministry of Environment (MOE) of the Republic of Korea.

P5-19

Strain-specific cloning and expression profiling of cycloisomaltooligosaccharide glucanotransferase (CITase) in *Escherichia coli*

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CITases were isolated from *Bacillus circulans* T-3040, *Paenibacillus* sp. 598K, *Bacillus circulans* U-155, *Paenibacillus daejeonensis*, and *Thermoanaerobacter thermocopriae*. Strains of *P. daejeonensis* and *B. circulans* were obtained from KACC, with strain numbers 11453 and 14392. The *T. thermocopriae* gene was synthesized by Macrogen based on the DNA sequence obtained from the NCBI database. Full-length genes were amplified via PCR using designed primers. BcCITase and PdCITase were digested with *Bam*HI and *Not*I, while TtCITase with *Bam*HI and *Sal*I. These fragments were cloned into pET28a and pET32a vectors, producing pET-BcCITase (8.3 kb, 110 kDa), pET-PdCITase (8.3 kb, 110 kDa), and pET-TtCITase (4.5 kb, 180 kDa). All plasmids were transformed into *E. coli* DH5α cells via electroporation. The constructs were transferred to BL21 (DE3) and BL21 AI strains, cultured in LB medium containing appropriate antibiotics, and induced with IPTG (0.1-1 mM) plus 20% L-arabinose at 18, 21, 25, and 37 ℃. Soluble BcCITase expresiion was confirmed after 18 hours of induction at 18 ℃ with 0.1 mM IPTG. PdCITase was also expressed under similar conditions, but exhibited low solubility and was predominantly found in the insoluble fraction. TtCITase was not expressed at any tested condition, indicating the need for vector or host optimization.

P5-20

Protective effects of sweet potato plant extract on muscle atrophy in sarcopenia models

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Sarcopenia is the age-related decline in skeletal muscle mass and function, leading to reduced mobility and frailty. In this study, we investigated the muscle-preserving effects of a sweet potato plant extract prepared by 24-hour water extraction at room temperature. In vitro, the extract inhibited the expression of muscle degradation proteins and enhanced the expression of muscle synthesis proteins. In a mouse model of dexamethasone-induced muscle atrophy, body weight and food intake remained unchanged, but the gastrocnemius and quadriceps muscle weights increased by 2.29 and 2.87 times, respectively, in the extract-treated group. The extract partially restored lean body mass and improved grip strength compared to the control group. Additionally, it reduced muscle damage markers, such as LDH, and lowered the gene expression of MuRF-1 and atrogin-1, similar to the positive control group. Muscle synthesis markers MyoD, MyoG, and MHC were elevated. In conclusion, sweet potato extract shows potential for developing preventive foods for elderly individuals or sarcopenia patients by inhibiting muscle loss and promoting regeneration. This work was supported by the National Institute of Crop Science (NICS), Rural Development Administration (RDA) (Project No. RS-2023-00224188)

P5-21

Apoptotic effect of *Euonymus alatus* (Thunb.) *Siebold*. leaf extract on human breast and prostate cancer cells

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Euonymus alatus (E. alatus) is widely distributed throughout Korea, Japan, and China. *E. alatus* has been traditionally utilized for medicinal purposes in various Asian countries. *E. alatus* is known to have various biological activities, including antioxidant, antidiabetic and anticancer properties. The present study evaluated the pro-apoptotic effect of an ethanol extract of E. alatus leaves in MDA-MB-231 and LNCaP cells. The ethanol extract most effectively inhibited cell proliferation in MDA-MB-231 and LNCaP cells when the cells were treated at 30 μg/mL for 24 hours, showing minimal toxicity to normal cells such as HMEC and RWPE-1. In addition, at 30 μg/mL, we observed nuclear condensation and membrane blebbing, which are hallmarks of apoptosis, in MDA-MB-231 and LNCaP cells, and confirmed increased caspase-3 activity through caspase-3 activation assay. Furthermore, we demonstrated the induction of caspase-3 activation, an important executioner of apoptosis, by detecting a decrease in pro-caspase 3 levels via western blot analysis. These results suggest that E. alatus leaf ethanol extract has potential as an anticancer agent by inhibiting cell proliferation and inducing apoptosis specifically in MDA-MB-231 and LNCaP cells. This work was supported by a National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (No. RS-2024-00351202)

P5-22

The inhibitory effect of mixed herbal extract on human prostate cancer cells

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Herbal medicines have been traditionally used to treat diseases and are known to have various efficacies and relatively few side effects. In this study, we confirmed the anticancer activity of extracts prepared using seven herbal medicines *(Trichosanthis Radix, Lonicera japonica, Taraxacum platycarpum, Forsythiae fructus, Scutellaria baicalensis, Scrophularia buergeriana, and Glycyrrhiza uralensis)* traditionally known to have anticancer effects. When the herbal extract was applied to LNCaP-FGC, MDA-MB-231, A549, and SK-MEL-2, the highest cell proliferation inhibition effect was observed in LNCaP-FGC cells. In addition, Annexin V/PI staining and Sub-G1 analysis of LNCaP-FGC demonstrated an increase in the number of apoptotic cells, and DNA fragmentation analysis and Hoechst 33258 staining provided evidence that the extract induced nuclear condensation and DNA fragmentation, both of which are hallmarks of apoptosis. These results show that the extract induced apoptosis in LNCaP-FGC cells. Therefore, the results of this study suggest that the herbal extract inhibits cell proliferation in LNCaP-FGC, MDA-MB-231, A549, and SK-MEL-2 cells, and induces apoptosis in LNCaP-FGC cells, indicating its potential as a functional anticancer agent and natural pharmacological resource.

P5-23

Wnt/β-Catenin-mediated skin regeneration induced by crude polysaccharides from *Sargassum pallidum*

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Seaweeds are rich in bioactive compounds, with polysaccharides particularly noted for their excellent biocompatibility and low toxicity. These polysaccharides exhibit antioxidant, anti-inflammatory, and skin-regenerative effects, including enhanced cell proliferation, wound healing, and extracellular matrix (ECM) production. This study evaluated the skin regenerative potential of crude polysaccharides extracted from Sargassum pallidum using Viscozyme-assisted hydrolysis and ethanol precipitation (SVCP). To assess its bioactivity, a series of in vitro and in vivo assays were conducted. In human dermal fibroblasts (HDFs), SVCP showed no cytotoxicity and significantly enhanced cell proliferation and migration, as measured by MTT and scratch assays. Western blot analysis revealed upregulation of Wnt/β-catenin signaling proteins (β-catenin, PCNA). ELISA results confirmed elevated levels of VEGF, IGF-1, EGF, and type I collagen. In zebrafish embryos, SVCP exhibited no developmental toxicity and also increased β-catenin and PCNA expression. Taken together, these findings highlight the strong skin-regenerative potential of SVCP and support its potential use in functional cosmetics or therapeutic applications.

P5-24

Comparison of *Cuscuta australis* R.Br extracts on the inhibition of adipocyte differentiation and their mechanisms of action

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This study examined the effects of Cuscuta australis R.Br (CA) on lipid accumulation, triglyceride (TG) level, and gene expression (qPCR analysis) in 3T3-L1 adipocytes. The CA extracts were prepared with water (CAW), ethanol (CAE), hot water (CAHW), and subcritical water (CASW) extraction methods. At a concentration of 100 μg/mL, all CA extracts effectively reduced lipid accumulation during adipocyte differentiation in 3T3-L1 cell. Furthermore, 100 μg/mL CAHW inhibited lipid accumulation compared to the control, as evidenced by TG levels. CA extract suppressed the expressions of key adipogenic genes, including CCAAT/enhancer-binding protein α (C/EBPα) and peroxisome proliferator-activated receptor γ (PPARγ). In addition, the treatment led to decreased expression of lipogenic genes, including diacylglycerol O-acyltransferase 2 (DGAT2), fatty acid synthase (FASN), and stearoyl-coenzyme A desaturase 1 (SCD1), with the CAHW exhibiting the strongest inhibitory effect. This study demonstrated that CA extracts inhibit adipocyte differentiation, with the CAHW showing the greatest effect.

P5-25

Regulation of anti-inflammatory responses by water and subcritical water extracts of dried laver via inactivation of NF-κB signaling pathways in LPS-induced RAW 264.7 macrophages

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This study investigated the anti-inflammatory effects of dried lavers, *Porphyra yezoensis* (P-yezo) and *Porphyra dentata* (P-dent), by comparing water extracts (WP-yezo, WP-dent) and subcritical water extracts (SP-yezo, SP-dent). Compared to the water extracts (WP-yezo and WP-dent), SP-yezo and SP-dent more effectively inhibited nitric oxide (NO) and reactive oxygen species (ROS) production in LPS-stimulated RAW 264.7 cells in a dose-dependent manner. Additionally, at the highest concentration (200 μg/mL), SP-yezo and SP-dent significantly reduced the levels of the pro-inflammatory cytokine interleukin-6 (IL-6) compared to WP-yezo and WP-dent. In particular, SP-dent not only suppressed gene and protein expression associated with the TLR4/NF-κB signaling pathway, but also down-regulated ERK1/2 activation. In conclusion, these results demonstrate that subcritical water extracts of dried laver (SP-yezo and SP-dent) inhibited the TLR4/NF-κB and ERK1/2 pathways in LPS-stimulated RAW 264.7 cells, highlighting SP-dent as the most potent extract.

P5-26

Antioxidant and anti-inflammatory activities of *Cuscutae semen* according to extract solvent in Raw 264.7 macrophages

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This study aimed to evaluate the antioxidant and anti-inflammatory activities of *Cuscutae semen* (CS), a parasitic plant harmful to its host and environment, using two extraction methods with different solvents: water (CSW) and ethanol (CSE). CSW and CSE each exhibited high antioxidant activities, exceeding 85%, with CSE showing significantly higher polyphenol and flavonoid contents, as well as superior ferric reducing antioxidant power (FRAP). The MTT assay confirmed no cytotoxicity up to 200 μg/mL for both extracts. Additionally, CSE demonstrated the strongest reactive oxygen species (ROS) scavenging activity. In LPS-stimulated RAW264.7 macrophages, all CS extracts inhibited nitric oxide (NO) production in a dose-dependent manner, with CSE showing a significantly greater reduction. At 200 μg/mL, CSE significantly reduced LPS-induced pro-inflammatory cytokine expression. Furthermore, CSE markedly suppressed mRNA expression of iNOS, COX-2, TNF-α, and IL-6, key mediators at the terminal stage of the inflammatory signaling pathway, demonstrating superior anti-inflammatory efficacy. These results suggest that CS possesses antioxidant and anti-inflammatory properties, especially in its ethanol extract.

P5-27

Improved stability and bioavailability of ascorbic acid via tailor-made phosphatidylcholine -based liposomes

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Liposomes were prepared to improve stability and bioavailability of ascorbic acid (AA) using a tailor-made phosphatidylcholine mixture (PCM), and soy PC (SPCL). The encapsulation efficiency of PCML was significantly higher than SPCL (50.4% vs. 39.4%, $p < 0.05$). PCML and SPCL exhibited similar particle sizes and zeta potentials. After 14 days of storage, the particle size of PCML increased up to 126-129 nm, whereas SPCL showed a significantly larger increase to 152-179 nm ($p<0.05$), indicating better storage stability of PCML. Additionally, the stability and bioavailability of AA in liposomal form (Lipo-AA) were evaluated under various pH conditions and in vitro digestion. Lipo-AA retained ~ 80% of its initial AA content under pH 2, 5, and 7, showing higher stability than free AA. During in vitro intestinal digestion, Lipo-AA exhibited significantly higher AA retention, and improved bioavailability in Caco-2 cells compared to free AA ($p<0.05$). The digestibility of PCM in liposomes was low (FFA, 11.3%), suggesting that the liposomal structure remained relatively intact, thereby protecting the encapsulated AA throughout gastrointestinal transit. In conclusion, encapsulating AA in liposomes using tailor-made PC can improve its storage stability and intestinal bioavailability.

P5-28

Beneficial effects of traditional fermented soybean sauce (Ganjang) on memory function, body water, and glucose metabolism: Roles of gut microbiota and neuroinflammation

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Scopolamine administration disrupted energy, glucose, and water metabolism and impaired memory function. All Ganjang treatments improved insulin sensitivity, reduced inflammation, enhanced glucose tolerance, and decreased visceral fat. Ganjang treatments improved memory function. The treatments reduced neuronal cell death in the hippocampal CA1 region, decreased acetylcholinesterase activity, and increased brain-derived neurotrophic factor mRNA expression. Metagenomic analysis demonstrated enhanced glycolysis/gluconeogenesis pathways and enhanced butanoate metabolism while reducing lipopolysaccharide biosynthesis and pro-inflammatory signaling. These findings suggest that Ganjang can ameliorate memory impairment in this murine model through multiple mechanisms: metabolic improvements, enhanced neurotrophic signaling, gut microbiota modulation, and reduced neuroinflammation via gut-brain axis activation. 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 2025.

P5-29

Protective effects of hydrolyzed *Gryllus bimaculatus* extract on dexamethasone-induced sarcopenia in C57BL/6 mice

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This study aimed to evaluate the protective effects of hydrolyzed Gryllus bimaculatus extract (GBE) against dexamethasone (DEX)-induced sarcopenia in C57BL/6 mice. Muscle atrophy was induced by intraperitoneal injection of DEX (20 mg/kg/day) for 10 consecutive days. GBE (100 or 200 mg/kg/day) was administered orally starting two days before DEX treatment and continued for 12 days. GBE significantly attenuated DEX-induced reductions in body weight, muscle mass, grip strength, and cross-sectional area of the tibialis anterior muscle. Furthermore, GBE administration upregulated the expression of muscle regeneration-related factors, including IGF-1, mTOR, MyoD, MYF5, and MYF6, while downregulating muscle atrophy markers such as myostatin, FoxO3a, MuRF1, and MAFbx. In addition, GBE enhanced antioxidant enzyme activity, reduced oxidative stress, and suppressed pro-inflammatory cytokines including IL-6 and TNF-α. These findings suggest that GBE may serve as a promising functional ingredient to prevent glucocorticoid-induced muscle atrophy and may offer therapeutic potential for the management of muscle wasting conditions. This research was financially supported by the Ministry of Trade, Industry and Energy, Korea, under the "Regional Innovation Cluster Development Program (R&D, P0025886)" supervised by the Korea Institute for Advancement of Technology (KIAT).

P5-30

Solar sea salt and heat-treated solar sea salts attenuate the risk of high salt diet-induced cardiac hypertrophy

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High salt intake increases the risk of hypertension, which leads to cardiovascular disease (CVD). Cardiac hypertrophy is known to be related to CVD. Our previous studies reported that mineral-rich solar sea salt (MRS) and bamboo salt lowered blood pressure compared to mineral-deficient salt (MDS). This study aimed to investigate the effects of various salts in a high salt diet-induced cardiac hypertrophy. Rats were fed diets containing various edible salts (8% NaCl) as follows: control (1.3% NaCl), MDS, MRS, and heat-treated solar sea salts (purple bamboo salt [PBS] and mineral-rich bamboo salt [MBS]) for 8 weeks. The MDS group showed the highest blood pressure compared with the other groups. The PBS and MBS groups showed a significant decrease in the cardiomyocyte diameter compared to the MDS group. The rats fed MRS, PBS, and MBS diets showed lower intensities of cardiac fibrosis and reduced expressions of cardiac hypertrophy-related proteins, including biomarkers of hypertrophy, fibrosis, and inflammation, than the rats fed MDS. Moreover, the prevention of cardiac hypertrophy was more effective in PBS and MBS groups than in the MRS group. These results suggest that MRS, PBS, and MBS give less cardiac hypertrophy compared to MDS via suppressing active hypertrophy markers.

P5-31

NFC 사과주스의 항산화 및 항당뇨 활성과 총 폴리페놀 함량의 상관관계

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전세계적으로 건강 및 웰니스에 대한 관심이 증가함에 따라 기능성 음료에 대한 소비자 선호도가 꾸준히 증가하고 있다. 본 연구에서는 기능성 식품으로서의 가능성을 평가하기 위해 시중에 유통 중인 NFC (Not-From-Concentrate, 비농축환원) 사과 주스 12종의 항산화 및 항당뇨 활성을 분석하였다. DPPH 라디칼 소거능은 104.43%에서 149.18% 범위였으며, 1번, 3번, 7번, 10번 시료가 높은 항산화 활성을 나타내었다(〉140%). 총 폴리페놀 함량 분석 결과, 3번, 7번, 10번 시료가 다른 시료에 비해 상대적으로 높은 함량(0.51-0.54 mg/mL GAE)을 보였으며, 총 플라보노이드 함량은 1번과 7번 시료가 가장 높게 나타났다(0.25 mg/mL QCE). 또한, 10번과 7번 시료는 강한 α-glucosidase 저해 활성을 보여, 다른 시료에 비해 낮은 수준의 가수분해된 포도당 함량을 나타내었다. NFC 사과 주스 내 포도당 함량 측정 결과, 7번 시료는 가장 낮은 농도(161.67 mg/mL)를 보여 혈당의 급격한 상승을 억제하는 데 도움이 될 수 있는 가능성을 시사하였다. 전반적으로, 폴리페놀 및 플라보노이드 함량이 높은 NFC 사과 주스는 향상된 항산화 활성과 α-glucosidase 저해 활성을 나타내었으며, 이는 NFC 사과주스의 기능성 특성이 생리활성 물질에 의해 영향을 받음을 의미한다. 본 연구 결과는 NFC 사과 주스가 산화 스트레스로부터의 보호 및 당뇨병 관리에 잠재적인 이점을 지닌 기능성 음료로 활용될 수 있음을 시사한다. 이 논문은 2023학년도 국립순천대학교 글로컬대학 사업비의 지원을 받아 연구되었다.

P5-32

Optimization of the extraction of polysaccharides from corn husk by natural deep eutectic solvent combined with ultrasound-assisted enzymolysis

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Corn husk contains a lot of cell wall polysaccharides such as cellulose and hemicellulose that have various functional properties. However, corn husk is treated as an agricultural by-product and is mostly discarded, so research is needed to confirm its potential as a food material. Therefore, this study was conducted to extract polysaccharides using a natural deep eutectic solvent (NADES) in conjunction with ultrasonic-assisted enzymolysis (UAE) to utilize corn husk as a functional food material. A Box-Behnken design was used to investigate the effects of four independent variables (liquid-to-solid ratio, temperature, time, and enzyme concentration) on extraction yield, total sugar content, and uronic acid content. The optimal extraction conditions were found to be 30 mL/g, 54°C, 115.15 min, and 0.77% for extraction yield; 22.42 mL/g, 41°C, 120 min, and 0.5% for total sugar content; and 22.22 mL/g, 46°C, 79.39 min, and 1.5% for uronic acid content. The experimental values obtained under these conditions were consistent with the predicted values. The above research results showed that NADES-based UAE is an efficient method for extracting polysaccharides from corn husk.

P5-33

Inhibition of dexamethasone-induced muscle atrophy via myostatin-related pathways by protease-hydrolyzed adzuki bean extracts

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Sarcopenia involves progressive muscle loss, causing serious health and societal challenges. This study aimed to investigate the inhibitory effect of adzuki bean (Vigna angularis) hydrolysates (ABH), prepared using three proteases including Alcalase, Flavourzyme, and Protamax, on dexamethasone (DEX)-induced muscle atrophy in C2C12 myotube. Native-PAGE and Tricine-SDS-PAGE followed by Coomassie Brilliant Blue staining revealed distinct protein banding patterns among the ABHs, indicating differences in peptide composition and molecular weight distribution. DEX significantly reduced myotube length and diameter, which were preserved upon ABH treatment, as confirmed by Jenner-Giemsa and immunofluorescence staining. Immunoblot and qPCR analysis showed downregulation of protein degradation markers (MuRF1, Atrogin-1, ubiquitin, and myostatin) and upregulation of protein synthesis-related signals (p-mTOR, p-Akt, and p-p70S6K) and myosin heavy chain. Among the ABHs, the Protamax-derived ABH (ABH_P) most effectively prevented DEX-induced myotube atrophy, showing the greatest suppression of myostatin expression. These findings suggest that ABHs, particularly ABH_P, may attenuate muscle atrophy by modulating myostatin pathways and have potential as a functional ingredient for muscle health. This research was funded by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (grant numbers RS-2021-NR060125).

P5-34

Probiotication and physicochemical properties of soybean meal hydrolysate by lactic acid bacteria

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Soybean meal, which is a by-product from soybean processing, has high protein content, excellent amino acid composition, and various bioactive compounds such as isoflavones and saponins. These components exhibit physiological activities including antioxidant and anti-inflammatory activities, suggesting soybean meal has value as a functional material. However, despite their excellent nutritional value and functionality, soybean meal is mainly used as feed, and research is needed to utilize soybean meal as a food material. In this study, soybean meal was hydrolyzed using commercial enzymes, fermented with lactic acid bacteria, and the physicochemical properties of the fermented hydrolysate were analyzed. Four Lactobacillus strains (*L. plantarum, L. acidophilus, L. casei, and L. rhamnosus*) were each inoculated at 0.5%(v/v) into soybean meal hydrolysate and fermented for 36 h. L. acidophilus showed the highest log CFU/mL at 36 h, while others showed the highest at 24 h. As fermentation progressed, pH decreased, titratable acidity increased, and reducing sugar and soluble protein content decreased. The results indicate that lactic acid bacteria grew well in soybean meal hydrolysate, suggesting soybean meal could be used as a plant-based fermented beverage material.

P5-35

Functional evaluation of the halophyte *Cnidium japonicum*: antioxidant and anti-adipogenic activities

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Cnidium japonicum is a halophytic plant adapted to saline environments such as coastal dunes, salt marshes, and inland salt flats. Its ability to tolerate fluctuating salinity levels is supported by well-developed defense mechanisms, enabling the production of unique bioactive compounds. Although previous studies have reported its antioxidant, anticancer, and antidiabetic properties, research remains limited due to its restricted natural distribution. To evaluate the biological activities of *C. japonicum*, we conducted *in vitro* antioxidant assays (DPPH, ABTS, FRAP, and reducing power), phytochemical analysis, and lipase inhibition testing. The extract showed a DPPH IC_{50} of 2.94 mg/mL, with polyphenol and flavonoid contents of 0.18 mg GAE/mL and 0.05 mg QE/mL, respectively. Lipase activity was inhibited by over 60%, indicating potential anti-obesity effects. These findings suggest that *C. japonicum* possesses significant antioxidant and anti-obesity properties. Along with evidence from previous studies, this plant shows promise as a valuable natural resource for the development of functional foods and pharmaceutical applications, particularly in the areas of antioxidant, anti-obesity, and anti-aging effects.

P5-36

Anti-obesity and antioxidant properties of mushroom mycelia-fermented germinated soybeans in 3T3-L1 cells

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This study investigated the functional properties of soybeans soaked and germinated with mushroom mycelia. Germinated soybeans were soaked with liquid cultures of *Lentinula edodes, Pleurotus ostreatus*, and *Ganoderma lucidum*, then germinated under controlled conditions. Total polyphenol and flavonoid contents were significantly higher in germinated and mushroom-treated samples, especially in those treated with P. ostreatus (53.6 mg GAE/g and 18.2 mg RE/g, respectively). ABTS radical scavenging activity was also markedly increased, with the highest effect observed in the *G. lucidum* group (up to 57.6%). In 3T3-L1 cells, lipid accumulation was suppressed in all fermented samples in a dose-dependent manner. Notably, Pleurotus- and *Lentinula*-treated samples showed inhibition rates exceeding 45% at 100 μg/mL. Cytotoxicity assay revealed that all samples maintained over 40% cell viability at the highest concentration, with *Pleurotus* and *Lentinula* groups exhibiting minimal cytotoxicity, maintaining 100% viability at 100 μg/mL. These results suggest that mushroom-treated germinated soybeans possess enhanced antioxidant and anti-obesity potential, supporting their application as functional food ingredients.

P5-37

Enhanced anti-inflammatory activity of *Inula Britannica* extract via liposomal encapsulation: A functional food approach

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The potential of liposome-encapsulated *Inula britannica* extract as a functional food ingredient with enhanced bioavailability and stability was investigated. Inula britannica is recognized for its anti-inflammatory properties and diverse health benefits. Using a scalable liposome production method, the extract was successfully encapsulated, and the physical properties of the liposomes were characterized. The liposomal extract demonstrated significantly improved anti-inflammatory effects in LPS-activated RAW 264.7 macrophages, evidenced by reduced levels of pro-inflammatory mediators such as NO and PGE2, and decreased expression of iNOS and COX-2. Additionally, the production of pro-inflammatory cytokines TNF-α, IL-6, and IL-1β was suppressed, alongside modulation of the NF-κB and MAPK signaling pathways. These results suggest that liposome-encapsulated *Inula britannica* extract holds promise as a functional food ingredient for the management and prevention of inflammation-related disorders. Enhanced absorption and stability provided by liposomal delivery may enable more effective utilization of the extract's bioactive properties, contributing to improved health and well-being.

P5-38

Evaluation of antioxidant properties and anti-obesity mechanisms of *Artemisia fukudo* extracts

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Surviving in salt-saturated coastal zones requires specialized physiological traits that only a few plant species possess. Among them, *Artemisia fukudo*, a salt-tolerant species endemic to Korea's coastal regions, presents strong potential as a source of biologically active compounds. In this study, the antioxidant performance of stem and root extracts of *A. fukudo* was examined through DPPH and ABTS assays. The stem extract demonstrated 84% DPPH and 90% ABTS radical scavenging activity, while the root extract showed slightly higher values at 86% and 91%, respectively. The root extract also showed superior reducing power compared to the stem. Quantification of total polyphenols revealed concentrations of 0.20 mg GAE/mL in the stems and 0.36 mg GAE/mL in the roots. To investigate anti-obesity effects, a lipase inhibition assay using a reverse micelle system was conducted. The extracts exhibited dose-dependent inhibition of enzyme activity, suggesting their potential to reduce dietary fat absorption effectively. These findings highlight *A. fukudo* as a multifunctional plant-based ingredient. Both extracts demonstrate promising characteristics for incorporation into antioxidant-rich, fat-regulating functional food formulations aimed at addressing modern health concerns.

P5-39

Evaluation of antioxidant and whitening activities of kiwi wine pomace for its potential use as a value-added cosmetic ingredient

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The present study investigated the antioxidant and whitening activities of kiwi wine pomace, a fermentation byproduct, to evaluate its potential as a value-added cosmetic raw material. The pomace was freeze-dried into powder and extracted using distilled water and 70% ethanol under reflux for 3 hours. The extracts were then analyzed for antioxidant activity, including DPPH radical scavenging capacity, reducing power, and total polyphenol content, as well as whitening activity. The DPPH radical scavenging activity was 99.5% for the aqueous extract and 96% for the ethanol extract at 800 μg/mL, indicating antioxidant capacity comparable to that of vitamin C. The ethanol extract also showed the highest reducing power (53.04 μM) and significantly greater total polyphenol content than the aqueous extract. In a melanin inhibition assay using B16F10 melanoma cells, both extracts significantly suppressed melanin synthesis in a dose-dependent manner, with the ethanol extract showing superior efficacy. These findings suggest that kiwi wine pomace can be effectively upcycled as a functional raw material for cosmetic formulations.

P5-40

Optimization of liposome manufacturing processes utilizing food-grade substances

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Liposomes serve as efficient delivery systems for introducing various bioactive compounds into the body. This study emphasizes sustainability by optimizing liposome preparation using food-grade ethanol as an eco-friendly solvent, along with food-grade components such as soybean lecithin and β-sitosterol. Compared to conventional methods, liposomes prepared with food-grade ethanol exhibited comparable particle size, ζ-potential, and morphological characteristics. Key parameters affecting liposome size and ζ-potential were identified through a Plackett-Burman design, which evaluated factors including soybean lecithin, β-sitosterol, and the water-to-oil (W/O) ratio. Optimal values for these variables were established via response surface methodology (RSM), yielding 3.17 g for soybean lecithin, 0.25 g for β-sitosterol, and a W/O ratio of 1:2.59. The reliability and validity of the optimization model were confirmed at these optimal conditions. The findings demonstrate that liposomes formulated with food-grade ethanol and components retain essential physicochemical properties while contributing to enhanced sustainability. This approach offers broad applicability in the food industry, prioritizing both safety and environmental responsibility.

P5-41

Analysis of functional components and biological activities in rapeseed (*Brassica napus* L.) across cultivars and growth stages

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Rapeseed (*Brassica napus* L.) is mainly cultivated for oil production and landscape use, but its potential as a functional food is underexplored. This study evaluated bioactive traits across cultivars and growth stages. Eight cultivars, including 'Halla', 'Tamra', and 'Yuryeo', were grown in a greenhouse and sampled at four stages: sprout, 20 cm and 40 cm (based on plant height), and bolting. Freeze-dried samples were analyzed for carotenoids, antioxidant activity, and antibacterial activity against *Streptococcus mutans*. Carotenoid content peaked at the 40 cm growth stage, with average values across eight cultivars reaching 63.7 mg/100 g DW for lutein and 42.5 mg/100 g DW for β-carotene. 'Yuryeo' at this stage showed the highest accumulation (72.6 and 48.6 mg/100 g DW, respectively). Antioxidant activity, assessed by reducing power, was highest in sprouts, with 'Halla' exhibiting the strongest value (2,792.5 mg TE/g DW). Antibacterial activity against S. mutans was generally stronger in extracts from the sprout and 20 cm-stages, with 'Tamra' at 20 cm showing the most potent effect (3.01 $\log_{10}$ CFU reduction, 99.9%). This study indicates that early-stage rapeseed, particularly sprouts and 20 cm-stage, may be promising sources of bioactive compounds for functional food applications. This work was supported by the "Research Program for Agriculture Science and Technology Development (Project No. PJ01742204)" of the Rural Development Administration, Republic of Korea.

P5-42

Viscozyme® L 처리를 통한 미선나무(*Abeliophyllim distichum*) 추출물의 식물성분 변화

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미선나무(Abeliophyllum distichum)은 물푸레나무과에 속하는 한반도 고유종으로, 1919년 처음 소개되었으며, 2005년 환경부에 의해 멸종위기 식물 II급으로 지정되었으나 2017년 해제되어 산업화 소재로서 활용할 수 있게 된 중요 자원식물로 최근 생리활성 화합물과 생리적으로 이용 가능한 식물성 화학물질을 규명하려는 과학계의 관심이 증가하고 있다. 본 연구에서는 Viscozyme® L 처리가 미선나무 잎의 식물성분에 미치는 영향을 조사하였다. LC-ESI/MS(liquid chromatography-elctrospray ionization-tandem mess spectrometry)를 이용한 프로파일링 결과, 검출 가능한 화합물의 총수는 무처리 추출물의 26종에서 효소처리 추출물의 16종으로 감소하였다. Viscozyme® L 처리 후, 플라보노이드 배당체, 피라논 유도체, 아미노산 관련 대사산물이 유의미하게 증가하는 등의 변화가 관찰되었다. HPLC(High performance liquid chromatography) 분석 결과, 효소 처리 후 rutin, acteoside, isoacteoside와 같은 당화 화합물이 유의미하게 감소한 반면, aglycone인 quercetin 함량은 대조군에 비해 4배 이상 증가하였다. 이러한 결과는 Viscozyme® L이 flavonoid glycosides의 aglycone 형태로의 탈당화를 촉진함을 시사한다. 이러한 효소적 변환은 바이오산업, 식의약학 산업 및 화장품산업 분야에서 미선나무 추출물의 생체이용율과 기능적 가치를 향상시킬 수 있는 잠재적인 전략을 제시한다.

P5-43

A survey on snack intake and acceptance of fruit and vegetable by-products for the development of antioxidant snacks in the elderly

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This study investigated the snacking behavior and ingredient preferences of older adults to develop of antioxidant-enriched snacks for elderly nutrition. A survey was conducted among 100 individuals aged 65 or older in Busan. The questionnaire covered general characteristics, snack intake patterns, preferences for apples, pomegranates, and beets (including by-products), awareness of antioxidant nutrients, and willingness to consume antioxidant snacks. Data were analyzed using SPSS 29.0 through frequency analysis, t-test, and ANOVA. Results showed that 61% of participants were overweight or obese, and 31% of participants consumed snacks daily. Fruits were the most frequently selected snacks (44%), and nutrition was the top selection criterion (53%). Apples were the most preferred ingredient (34%), though 33% rejected apple by-products. Preferences for pomegranates and beets were lower, with higher rejection of their by-products. Despite 65% lacking awareness of antioxidant nutrients, 89% were willing to consume antioxidant snacks. These results suggest that snack development for older adults should focus on familiar ingredients and enhance the acceptability of by-products by highlighting their antioxidant benefits to promote healthy aging.

P5-44

Water extract of desalted *Salicornia europaea* inhibits RANKL-induced osteoclast differentiation and prevents bone loss in ovariectomized mice

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This study investigated the effects of water extract of desalted Salicornia europaea (WSE) on osteoclast differentiation and bone loss in ovariectomized mice. WSE inhibited RANKL-induced osteoclastogenesis, bone resorption, and F-actin ring formation, downregulated osteoclast-related genes, and improved bone density in ovariectomized mice. Three types of dicaffeoylquinic acids (DCQAs) contained in WSE also inhibited osteoclast activity and reactive oxygen species production. These findings suggest that WSE and its compounds, DCQAs, have potential as preventive or therapeutic agents against osteoporosis.

P5-45

Effects of tomato and lycopene intake on cardiovascular risk factors: An umbrella review and meta-analysis

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This meta-review synthesized evidence from systematic reviews and meta-analyses on the effects of tomato or lycopene intake on cardiovascular risk factors. A comprehensive search was conducted on April 8, 2025, in PubMed, Scopus, and ScienceOn, following PRISMA 2020 guidelines. Eligible studies included adults, tomato or dietary lycopene intake, and cardiovascular outcomes. Two reviewers independently screened studies and extracted data. Methodological quality was assessed using AMSTAR 2, and overlap among primary studies was evaluated using the corrected covered area (CCA). Pooled effect sizes were calculated using Hedges' g, and the certainty of evidence was appraised via GRADE. Of 778 records, nine reviews met the inclusion criteria. AMSTAR 2 rated one review high, four moderate, and four low in quality, while the CCA was 9.65%, indicating acceptable overlap. Excluding low-quality reviews, meta-analysis revealed reductions in blood pressure, but not in lipid parameters. In the GRADE assessment, all outcomes except HDL-C were rated moderate or higher. In conclusion, daily intake of 5-30 mg lycopene, equivalent to one or more medium tomatoes, may contribute to cardiovascular health by lowering blood pressure. This research was supported by the Research Program for Food Sciences Development under the National Institute of Crop and Food Science (NICS), Rural Development Administration (RDA), South Korea (grant number: PJ01760201). This study was also supported by the 2025 RDA Fellowship Program of NICS, Rural Development Administration, Republic of Korea.

P5-46

농산물 효능-성분 지식 DB 구축 현황과 산업적 적용 전망

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소비자들의 건강에 대한 관심 증가와 인공지능 기반 식품·헬스 산업의 확대에 따라, 국산 농산물의 기능성과 성분 정보를 체계적으로 관리한 지식 DB의 중요성이 커지고 있다. 농촌진흥청은 국산 농산물 기반 기능성 소재 개발과 산업체 지원을 위해 2016년부터 효능 정보를 구축해왔으며, 2022년 국내 최초로 효능과 성분을 연계한 농산물 효능-성분 지식 DB를 공개했다. 현재 약 104품목을 대상으로 3,800건 이상의 데이터가 누적되어 있으며 농식품올바로 플랫폼(koreanfood.rda.go.kr)을 통해 서비스 중이다. DB에는 연구 논문 데이터를 기반으로 한 기능성 소재의 섭취 형태, 기능성 시험 결과, 지표 성분 정보 등이 포함된다. 건강기능식품 헬스클레임과 평가항목 기준에 맞춘 표준화도 추진 중이며, 2026년부터는 비표적대사체 등 첨단 데이터도 확대된다. 본 DB는 건강기능식품 개발 연구의 기초 자료로 활용될 수 있으며, 소비자들이 정확한 기능성 정보에 쉽게 접근할 수 있는 서비스를 제공한다. K-농산물을 활용한 제품개발부터 맞춤형 서비스, 마케팅까지 국내 농식품 산업의 발전 및 상업적 가치 창출에 중요한 역할을 할 것으로 기대된다. 본 연구는 농촌진흥청 국립식량과학원 연구사업(PJ01760201)의 지원에 의해 이루어진 것입니다.

P5-47

Therapeutic effects of pentosan polysulfate sodium on the prostate and lower urinary tract via GAG layer restoration in a BPH model

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Benign prostatic hyperplasia (BPH) is a prevalent condition in aging males, often accompanied by lower urinary tract symptoms (LUTS) resulting from prostate enlargement and dysfunction of adjacent organs such as the bladder and urethra. Pentosan polysulfate sodium (PPS), a semi-synthetic glycosaminoglycan (GAG) mimetic, has been primarily used to restore the GAG layer in bladder epithelial tissues. In this study, we evaluated the therapeutic effects of PPS on the prostate and lower urinary tract using a BPH model induced by orchiectomy. PPS was administered orally, and its impact was assessed through measurements of body weight change (%), prostate weight (g, %), epithelial thickness, and histological analysis using H&E staining. Hormonal alterations were quantified via ELISA for DHT and 5α-reductase in prostate tissue, while Western blotting was employed to analyze molecular markers involved in BPH pathology. Additionally, bladder and urethral tissues were examined using H&E and Alcian blue staining to evaluate GAG layer integrity. Our findings demonstrate that PPS significantly attenuates prostate hyperplasia and inflammation, potentially through restoration of the GAG barrier in the bladder and urethra, thereby improving LUTS. These results suggest that PPS exerts a dual action by modulating both epithelial protection and inflammatory pathways, offering a promising therapeutic strategy for BPH management.

P5-48

Protective role of Prunus persica extracts in preventing UV-induced skin aging through antioxidant and anti-inflammatory activities

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The skin serves as a primary barrier protecting the body from external environmental factors, and exposure to ultraviolet (UV) radiation is a major contributor to oxidative stress, inflammation, and skin aging. In particular, UVB (280-320 nm) possesses high energy that induces cellular damage and inflammatory responses, making it a widely used stimulus in in vitro skin damage models. This study aimed to evaluate the skin-protective effects of regionally sourced natural products using a UVB-induced skin damage model. Initially, the anti-inflammatory activities of extracts from Prunus persica var. lutea (PPL, yellow peach), Prunus persica var. alba (PPA, white peach), Prunus mume (PM, plum), and Fragaria × ananassa (FA, strawberry) were screened using human keratinocytes (HaCaTs). Among them, yellow and white peach extracts showed the most potent anti-inflammatory effects. Based on these results, further analyses focusing on the antioxidant and anti-inflammatory effects of the two peach extracts were conducted using human dermal fibroblasts (HDFs). The results demonstrated that peach extracts effectively suppressed UVB-induced reactive oxygen species (ROS) generation, restored the expression of extracellular matrix (ECM)-related genes, and inhibited the activation of the MAPK (ERK, p38, and JNK) and NF-κB signaling pathways, as well as the expression of pro-inflammatory cytokines. These findings suggest that peach extracts hold promise as natural functional ingredients for alleviating UVB-induced skin damage.

P5-49

Therapeutic effects of pentosan polysulfate sodium on the prostate and lower urinary tract via GAG layer restoration in a BPH model

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Benign prostatic hyperplasia (BPH) is a common condition in aging males, causing lower urinary tract symptoms (LUTS) due to prostate enlargement and bladder/urethral dysfunction. Pentosan polysulfate sodium (PPS), a glycosaminoglycan mimetic, is known to restore the GAG layer in bladder tissue. In this study, we evaluated the therapeutic effect of orally administered PPS in an orchiectomy-induced BPH mouse model. PPS significantly reduced prostate weight, epithelial thickness, and inflammation, as confirmed by H&E staining and Western blot. ELISA was used to assess DHT and 5α-reductase. Additionally, GAG integrity in bladder and urethra was examined via Alcian blue staining. Our findings suggest that PPS alleviates BPH by modulating epithelial and inflammatory pathways, offering potential for LUTS improvement.

P5-50

In vitro antioxidant and anti-inflammatory activities of *Solanum nigrum* collected at different harvest time

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Solanum nigrum L., a widely distributed annual herbaceous plant in Korea, belongs to the Solanaceae family. Traditionally referred to as "Yonggyu" (龍葵) in Korean medicine, it is described in the Donguibogam as having a cold nature and bitter taste. Despite its medicinal history, limited research has addressed the impact of harvest timing on its biological activities. In this study, S. nigrum samples were collected four times from July to September from the Medicinal Plant Garden of Sunchon National University to evaluate changes in their biological properties. Antioxidant and anti-inflammatory activities were assessed, along with total polyphenol content. Among the samples, those harvested on August 30 exhibited the highest total polyphenol content, as well as the strongest antioxidant and anti-inflammatory effects. A strong correlation was observed between antioxidant activity and nitric oxide inhibition in the ethanol extract of roots harvested on this date. These findings suggest that *S. nigrum*, particularly when harvested at the appropriate time, holds promise as a source of natural antioxidants and anti-inflammatory agents, with potential applications in food and pharmaceutical products.

P5-51

Physicochemical composition and antimicrobial effects of *Hypsizygus marmoreus* with distinct morphological traits

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Hypsizygus marmoreus, a member of the Tricholomataceae family, is increasingly popular due to its pleasant nutty flavor, crisp texture, and health-promoting bioactive components. In this study, the bioactive compound content and antibacterial activity of two phenotypes brown and white *H. marmoreus* were compared. Total polyphenol content was higher in the brown phenotype. Among organic acids, the brown variety contained approximately 2.67 times more gallic acid and 1.18 times more epi-catechin than the white variety. Conversely, the total free sugar content was 1.86% in the brown phenotype and 3.55% in the white, with galactose showing a statistically significant difference. Antibacterial assays against 12 bacterial strains, including food borne pathogens and vaginitis related bacteria, revealed that the brown phenotype exhibited stronger antimicrobial activity. Notably, the brown *H. marmoreus* demonstrated potent activity against food-derived *Pseudomonas* strains, likely due to its high gallic acid content. These findings provide scientific data on the functional component differences between brown and white *H. marmoreus*, which may guide consumer choices and industrial applications. This paper has been written with the support of Jeollannam-do ('2025 R&D supporting program' "Development and Industrialization of Bronchial Health Foods Using Cordyceps Mycelium-Fermented Sword Bean Extract" operated by Jeonnam Technopark).

P5-52

Effects of fermented products using kimchi-derived lactic acid bacteria and plant extracts on digestive enzyme and antioxidant activities

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In this study, a plant extract-based synthetic medium was developed to support the growth of kimchi-derived lactic acid bacteria for membrane vesicle (MV)-based postbiotics. This medium promoted the growth of *Leuconostoc mesenteroides* (Lm), *Lactiplantibacillus plantarum* (Lp), *Latilactobacillus curvatus* (Lc), and *Latilactobacillus sakei* (Ls). The effects of their fermented products on digestive enzyme activity and antioxidant capacity were also examined. The influence of barley sprout and Baechu was compared using both water extracts and powder-based samples. The impact of adding a plant mixture (*Platycodon grandiflorum : Codonopsis lanceolata : sweet potato peel = 1:1:3*) was also assessed. Lm, Lp, Lc, and Ls seeded into barley sprout extract showed strong growth from day 1, while Baechu extract supported slower growth starting on day 2. Barley sprout extract was more suitable for Lm and Lp. Adding the plant mixture had minimal effect on bacterial growth. Fermented products enhanced trypsin activity compared to non-fermented controls, especially those from barley sprout. α-Amylase activity was significantly reduced. These products increased total phenolics, were rich in flavonoids, and showed dose-dependent DPPH radical scavenging activity. Thus, plant extracts like barley sprout can be used as media, and their fermented products serve as functional ingredients with enhanced trypsin and antioxidant activity. This study was conducted by research funds from Gwangju University in 2025.

P5-53

Aucklandia lappa ethanol extract attenuates inflammation and protects intestinal barrier integrity *in vitro*

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This study aimed to evaluate the anti-inflammatory and intestinal barrier-protective effects of a 70% ethanol extract of *Aucklandia lappa* (ALE) using RAW264.7 macrophages and Caco-2 intestinal epithelial cell models. In lipopolysaccharide (LPS)-stimulated RAW264.7 cells, ALE (0.5-5 μg/mL) significantly inhibited nitric oxide (NO) production and suppressed inducible nitric oxide synthase (iNOS) protein expression. ALE also markedly downregulated the mRNA expression of pro-inflammatory cytokines, including TNF-α, IL-6, and IL-1β. Mechanistic studies revealed that ALE modulates both the NF-κB and Nrf2/HO-1 signaling pathways, which are key regulators of inflammatory responses. The intestinal barrier-protective effects of ALE were further investigated in Caco-2 cells. Exposure to LPS and pro-inflammatory cytokines released from activated RAW264.7 cells led to a decrease in transepithelial electrical resistance (TEER), indicating disruption of tight junction integrity. ALE treatment (0.5-5 μg/mL) restored TEER in a dose-dependent manner and increased the expression of occludin and ZO-1, two critical tight junction proteins. These findings suggest that ALE exerts both anti-inflammatory and intestinal barrier-protective effects under inflammatory conditions, highlighting its potential as a functional food ingredient or therapeutic adjuvant for inflammatory bowel disease (IBD).

P5-54

Development of a hypoallergenic ark shell product using an allergy-induced mouse model

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In an allergy-induced mouse model, allergic biomarkers in plasma and spleen were evaluated following oral administration of raw ark shell and three developed products (Product 1: pickled ark shell, Product 2: seasoned ark shell, Product 3: ark shell protein shake). Specifically, the levels of immunoglobulin E (IgE), histamine, and cytokines (TNF-α, IL-4, IL-5, IL-13) were measured, and rectal temperature as well as diarrheal responses were also assessed. Histamine and cytokines levels in the blood and spleen were higher in the raw ark shell group than in the positive control group (100 mg albumin/kg). However, mice administered the three developed products showed a significant reduction in histamine and cytokines (TNF-α, IL-4, IL-5, IL-13) levels compared to the raw ark shell group. Rectal temperature decreased following administration of raw ark shell, whereas the groups receiving the three developed products showed no significant changes in rectal temperature compared to the normal control group. The groups administered with the three developed products also showed a reduction in allergy-induced diarrheal responses. Therefore, it was confirmed that the three developed products are hypoallergenic ark shell products. This work was supported by the Ministry of Small and Medium-sized Enterprises (SMEs) and Startups through the '2020 Regional Specialized Industry Development Plus (R&D)-Regional Star Company Promotion Project (No. S2868121)'.

P5-55

Protective effects of mackerel protein hydrolysates against oxidative stress-induced atrophy in C2C12 myotubes

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Muscle aging and atrophy in the elderly are closely associated with increased oxidative stress in muscle tissue. Bioactive peptides derived from protein hydrolysates have emerged as promising functional ingredients for alleviating sarcopenia due to their antioxidant properties and enrichment in essential amino acids. In a preliminary screening, mackerel protein hydrolysate (MPH) showed notable protective effects in a myotube atrophy model. This study evaluated the anti-atrophic potential of MPHs produced using different enzymes in H2O2-treated C2C12 myotubes. Among five hydrolysates, the alcalase-derived hydrolysate (MHA) demonstrated the most potent effects in maintaining myotube diameter, restoring myosin heavy chain (MYH) expression, and downregulating the atrophy-related genes MAFbx and MuRF1. Mechanistically, MHA activated the Akt/FoxO signaling pathway and inhibited NF-κB activation, thereby reducing muscle protein degradation. Additionally, MHA significantly lowered intracellular ROS levels and showed strong direct antioxidant activity. Amino acid and molecular weight profiling revealed high levels of essential amino acids and low-molecular-weight peptides, suggesting a synergistic contribution to its bioactivity. These findings suggest that MHA is a promising food-derived functional material with anti-atrophic and antioxidant properties and may be useful in preventing or managing age-related muscle loss such as sarcopenia, warranting further preclinical validation.

P5-56

A study on the antioxidant activity and hair loss improvement effects of *Achyranthes japonica* extracts

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This study evaluated the functionality of water and ethanol extracts of *Achyranthes japonica* to develop a functional shampoo containing *Achyranthes japonica* extract. Total polyphenol and flavonoid contents were measured, and ABTS, DPPH radical scavenging activity, and SOD-like activity were measured. To measure the hair loss improvement effect, the expression levels of SRD5A2, IGF, EGF, and VEGF were measured, and cytotoxicity in HDPC and LNcap cells was measured. Total polyphenol and flavonoid contents were higher in the water extract than in the ethanol extract, and ABTS, DPPH radical scavenging activity, and SOD-like activity were also confirmed to be higher in the water extract. The water extract of *Achyranthes japonica* decreased SRD5A2 and increased IGF, EGF, and VEGF, showing a hair loss improvement effect. In addition, the extract did not show cytotoxicity in HDPC and LNcap cells. These results suggest that the water extract of *Achyranthes japonica* has excellent antioxidant effects and excellent hair loss improvement effects, and can be usefully utilized as a shampoo material.

P5-57

A clinical evaluation of skin safety and functionality of shampoo formulated with fermented *Achyranthes japonica* extracts

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This study aimed to evaluate the dermatological safety and functional efficacy of a shampoo formulated with fermented Achyranthes japonica extracts. A series of human clinical trials were conducted, including a skin irritation assessment, scalp cooling evaluation, and exfoliation improvement analysis. In the patch test involving 34 healthy Korean adults, the product exhibited a skin irritation index of 0.00, classifying it as "non-irritating (excellent)." A single-use clinical trial employing FLIR E75 thermal imaging demonstrated a significant reduction in scalp surface temperature by 8.04% ($p<0.001$), indicating a notable cooling effect. Furthermore, digital image analysis using the Folliscope 5.0 revealed a statistically significant decrease of 81.51% in scalp keratinized area ($p<0.001$), confirming its exfoliation efficacy. No adverse dermatological reactions were reported across all evaluations. These findings suggest that the fermented *Achyranthes japonica* extracts-based shampoo is dermatologically safe and provides measurable functional benefits for scalp cooling and exfoliation, even after a single application.

P5-58

Anti-tumor effect of Gochujang (Korean red chili paste) on AOM/DSS-induced colitis-associated colorectal mouse model

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Colorectal cancer (CRC) is the third most common cancer worldwide and is influenced by chronic inflammation and environmental factors. Gochujang (GJ), a traditional Korean fermented red chili paste, is rich in functional components such as capsaicin, soy-derived peptides, and fermentation-derived metabolites. It has been reported to exert antioxidant, anti-inflammatory, and anti-obesity effects. However, GJ also contains biogenic amines (BAs) produced during fermentation, which may cause adverse effects. In this study, we analyzed the BA content in four GJ samples and evaluated their anti-tumor effects in an AOM/DSS-induced colitis-associated CRC mouse model. All samples contained BAs such as tyramine and histamine, but GJ administration alleviated pathological changes, including shortened colon length, increased colon weight-to-length ratio, and elevated tumor count. It also reduced inflammatory cytokine levels in blood. Histology showed improved mucosal integrity and reduced goblet cell loss. These results suggest that despite the presence of biogenic amines, GJ may exert protective effects against colitis-associated colorectal cancer through its anti-inflammatory activity. This work was supported by “Functional research of fermented soybean food (safety monitoring)” under the Ministry of Agriculture, Food and Rural Affairs and partly Korea Agro-Fisheries and Food Trade Corporation in 2025.

P5-59

Anticancer activity of cordycepin derived from soybean-based *Cordyceps militaris* against PC-9 lung cancer cells

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Cordyceps militarisis a medicinal fungus known for its diverse biological activities, including anti-inflammatory, antioxidant, and anticancer effects, largely attributed to cordycepin (3′-deoxyadenosine). This study aimed to enhance cordycepin production by cultivating *C. militaris* mycelia in a soybean-based medium. The cordycepin content reached 13.75 mg/g in the mycelia, and 46.5 mg of purified cordycepin was obtained. Its antiproliferative activity was evaluated on PC-9 human lung cancer cells using the MTT assay. Results showed a significant, dose-dependent inhibition of cell proliferation ($p<0.05$). These findings demonstrate that soybean-based cultivation of *C. militarisis* effective for producing cordycepin-rich mycelia with potent anticancer activity. This approach supports the development of plant-based functional materials for use in cancer prevention or therapy. This research was supported by the Ministry of Trade, Industry & Energy (P0020990).

P5-60

Strategic approaches to high-value functional material development from agro-food by-products

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Agro-food by-products are gaining attention as promising resources for sustainable and functional food material development. This study aims to provide scientific evidence for the functional potential of domestic agro-food by-products and to propose a strategic model for their resource valorization. In the first year (2025), acorn jelly (dotori-muk) residue was selected, and its ability to inhibit intracellular lipid accumulation was evaluated through in vitro assays. Additionally, a standardized manufacturing process for acorn jelly residue extract was established. In the second year (2026), carrot pomace was selected and is currently undergoing functional evaluations. For the third year (2027), candidate materials were screened using production and compositional data provided by the Nonghyup Food R&D Center. Among the candidates, persimmon vinegar residue was identified as a promising material due to its industrial feasibility and potential health benefits. Collaborative research is underway to verify its functional properties and develop it as a high-value food material. This study is expected to contribute to the development of functional materials and promote sustainable utilization of agro-food by-products in the food industry.

P5-61

Quantitative analysis of chlorophyll, carotenoids, sesquiterpene lactones contents in ten *Lactuca sativa* L. varieties

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Lactuca sativa L. (lettuce) contains chlorophylls, carotenoids with antioxidant activity, and sesquiterpene lactones (SLs) responsible for its bitterness and various bioactivities. Although these components have been quantified in certain cultivars or growth stages, comparative analyses across multiple cultivars are limited. This study aims to quantitatively compare the concentrations of chlorophyll a, chlorophyll b, total carotenoids, and sesquiterpene lactones in ten diverse lettuce varieties. The total lutein and β-carotene content varied significantly depending on cultivar and genetic line. No significant differences were observed in the levels of lutein and β-carotene among green lettuce cultivars. In contrast, the β-carotene levels in the red cultivars Heukharang and *Jeokgang* romaine were significantly higher. For chlorophyll a, no significant differences were observed among green and red lettuce cultivars, except that *Jeokchima* showed a lower content. In contrast, chlorophyll b levels were highest in *Jeokgang* romaine, followed by *Heukharang*. Lactucin content in *Heukharang* was markedly higher than in other cultivars, although 8-deoxy-lactucin was not detected. These findings support the selection of cultivars for enhanced nutritional and functional value. This research was supported by the National Institute of Crop and Food Science under the Rural Development Administration, Republic of Korea (Grant No.PJ01760202).

P5-62

Assessing cellular metabolic activity and mitochondrial function with a novel FBS alternative derived from Mealworm (*Tenebrio molitor*) protein hydrolysates

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Alcalase-derived mealworm protein hydrolysate (TAH) has emerged as a promising sustainable alternative to fetal bovine serum (FBS) due to its rich nutrient profile and bioactivity. To evaluate the equivalence of FBS:TAH (3:7) to standard FBS, we conducted Seahorse real-time cell metabolic analysis. Minor differences in mitochondrial function, including oxygen consumption rate (OCR) and extracellular acidification rate (ECAR), were observed between cells cultured in FBS:TAH (3:7) and 10% FBS. In contrast, FBS:TAH (1:9) caused marked mitochondrial changes. Similar tests with three commercial FBS products revealed inherent variability, with one showing differences similar to those between FBS and FBS:TAH (3:7). Moreover, the expression of genes related to mitochondrial function, including key components of the electron transport chain and ATP synthesis, were not significantly different between the FBS and FBS:TAH (3:7) groups. These results indicate that FBS:TAH (3:7) supports mitochondrial function at a level comparable to that of standard FBS and falls within the range of natural variability observed among commercial FBS products. This highlights the potential of TAH as a viable partial substitute for FBS in cell culture applications, particularly in maintaining cellular metabolic activity and mitochondrial integrity.

P5-63

Fucoidan derived from *Saccharina japonica* alleviates UVB-induced cellular apoptosis and inflammation in human dermal fibroblasts

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Fucoidan from Saccharina japonica (SJF) was isolated and characterized to evaluate its protective effects against UVB-induced damage in human dermal fibroblasts (HDFs). SJF exhibited strong antioxidant activity, as demonstrated by ABTS, DPPH, and ferric reducing antioxidant power assays. In UVB-exposed HDFs, SJF enhanced cell viability by reducing intracellular ROS levels and restoring mitochondrial membrane potential. It significantly decreased sub-G1 cell accumulation and both early and late apoptosis. SJF modulated the expression of apoptosis-related proteins, upregulating Bcl-2, Bcl-xL, and PARP while downregulating Bax, cleaved caspase-3, p53, cleaved PARP, and cytochrome C. Antioxidant response proteins HO-1, NQO1, and Nrf2 were also upregulated. Furthermore, SJF suppressed the expression of pro-inflammatory cytokines (IL-6, IL-8, IL-13, IL-33, IL-1β, TNF-α, IFN-γ) via inhibition of the NF-κB/MAPK pathways. It also reduced MMPs, TIMPs, elastase, and collagenase activities in a dose-dependent manner. These findings suggest that SJF effectively mitigates UVB-induced oxidative stress, apoptosis, and inflammation in skin cells. This research was supported by KIMST, funded by the Ministry of Oceans and Fisheries (20220128).

P5-64

Ameliorative effects of *Saccharina japonica* fucoidan against inflammation in skin cells and a mouse ear edema model

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This study examined the extraction, characterization, and anti-inflammatory effects of fucoidan from Saccharina japonica (SJF) in models of particulate matter (PM)-induced skin inflammation. Chemical analysis revealed that SJF contains 15.82±0.07% sulfate and 29.82±0.86% fucose. In PM-stimulated HaCaT keratinocytes, SJF enhanced cell viability by reducing reactive oxygen species (ROS) levels. It also dose-dependently suppressed inflammatory cytokines (IL-6, IL-8, IL-13, IL-25, IL-33, TNF-α, IFN-γ, TSLP) and chemokines (MDC, TARC) via regulation of the NF-κB/MAPK pathways. Conditioned media from SJF-treated HaCaT cells alleviated inflammation and extracellular matrix (ECM) degradation in human dermal fibroblasts (HDFs), reducing cytokines, MMPs, TIMPs, and elastase activity. In vivo, topical application of SJF significantly reduced ear thickness in a BALB/c mouse model of TPA-induced ear edema and downregulated inflammatory enzymes iNOS and COX-2. These findings suggest that SJF effectively mitigates PM-induced oxidative stress, inflammation, and ECM damage in skin cells, supporting its therapeutic potential in skin protection. This research was supported by KIMST, funded by the Ministry of Oceans and Fisheries (20220128).

P5-65

발효 강낭콩 유래 렉틴의 미토콘드리아 기능 회복과 세포 안정화에 따른 배양육 기반 응용 가능성 평가

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배양육 생산에서 세포의 생존율과 기능성 유지는 최종 제품의 품질과 생산 효율에 결정적인 영향을 미친다. 특히 미토콘드리아는 세포 내 에너지 대사와 항상성 유지에 핵심적인 역할을 하며, 바이러스 감염이나 산화 스트레스는 기능 저하와 세포 사멸을 유발할 수 있다. 본 연구에서는 인플루엔자 A 바이러스 감염 모델에서 발효 강낭콩(Navy bean) 유래 렉틴이 세포 내 미토콘드리아 기능과 미토파지 조절에 미치는 영향을 평가하였다. MDCK 세포에 추출물을 감염 전 1회 선처리하고 감염 후 12시간 간격으로 2회 추가 처리한 결과, ROS 수치가 약 7% 감소하고, TFAM 및 PINK1 유전자의 발현이 각각 46배, 38배 증가하였다. 이러한 결과는 발효 강낭콩 유래 렉틴이 손상된 미토콘드리아 기능 회복과 항상성 유지에 기여함을 시사하며, 배양육 생산에서 세포 안정성과 항스트레스 기능을 높이는 유효 소재로 활용될 수 있음을 보여준다. 더불어, 해당 물질은 노화, 신경퇴행성 질환, 항바이러스 보조제, 기능성 식품 등 다양한 바이오헬스 분야로의 확장 가능성도 제시한다.

P5-66

JAM-A 하향 조절을 통한 고양이 칼리시바이러스 감염 억제 및 신장 여과기능 개선에 미치는 발효 강낭콩 추출물의 영향

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반려동물 산업의 성장과 함께 질병 예방 및 면역 증진에 기여하는 기능성 펫푸드에 대한 관심이 증가하고 있다. 특히 상부 호흡기 감염, 구내염 등 바이러스성 질환에 취약한 고양이를 위한 항바이러스 및 조직 보호 기능의 식물성 소재 개발은 고부가가치 펫푸드를 위한 전략으로 주목받고 있다. 고양이 칼리시바이러스(Feline calicivirus, FCV)는 숙주 세포막의 JAM-A 수용체를 통해 침투하며, 감염 후 NF-κB 활성화 및 ECM(세포외기질) 관련 유전자(MMP9, COL4A1 등)의 발현 증가로 염증과 섬유화를 유도해 조직 손상을 일으킨다. ECM 단백질 과잉 축적은 세포 간 신호전달을 방해하고 조직 기능을 저하시켜 만성 질환이나 신장 손상 등 2차 질환 위험을 높인다. 본 연구에서는 발효 강낭콩 추출물(Fermented Bean Extract, FBE)의 항바이러스 및 ECM 섬유화 억제 효과를 CRFK 세포에서 평가하였다. FBE는 FCV 복제를 약 3.8 log 수준까지 억제하고, JAM-A, NF-κB, MMP9, COL4A1 유전자 발현을 모두 감소시켜 염증과 조직 손상을 동시에 완화하였다. 이는 FBE가 반려동물 기능성 펫푸드 소재로서 항바이러스 및 조직 보호 기능을 겸비한 식물성 이중기능성 원료로 활용될 수 있음을 시사한다.

P5-67

Development of a house dust mite-induced lung dysfunction model for evaluating the protective effects of *Prunus mume* extract

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Prunus mume, commonly known as Japanese apricot, has traditionally been used for its anti-inflammatory, antioxidant, and fatigue-reducing properties. During its processing, large amounts of by-products such as peel, pulp, and seeds are generated; however, their functional utilization remains limited due to an insufficient understanding of their value. In this study, we evaluated the protective effects of *Prunus mume* extract against house dust mite (HDM)-induced lung injury using a BALB/c mouse model. The extract was administered orally at doses of 50, 100, and 200 mg/kg/day for 6 days. It significantly attenuated HDM-induced pulmonary tissue damage and inflammatory cell infiltration. Furthermore, the extract markedly reduced the phosphorylation of key inflammatory signaling proteins, including AKT, ERK, JNK, and NF-κB in vivo. In addition, it exhibited strong antioxidant activity by dose-dependently suppressing the production of reactive oxygen species (ROS) and nitric oxide (NO). These findings suggest that *Prunus mume* extract has potential as a functional natural material for alleviating HDM-induced pulmonary inflammation through its anti-inflammatory and antioxidant actions. This study was supported by the Imsil Cheese Food & Research Institute in 2025.

P5-68

Neuroprotective potential of citrus peel extracts: Flavonoid profiling and *in silico* docking approaches

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Alzheimer's disease is a neurodegenerative disease characterized by cognitive decline, with oxidative stress and tau hyperphosphorylation contributing to its pathogenesis. This study aimed to profile flavonoids in citrus peel, a major byproduct of citrus processing, evaluate the neuroprotective effects of their ethanolic extracts (CPEs) in H2O2-induced PC12 and tau-expressing HEK293T cells, and explore key flavonoid-target interactions via in silico molecular docking. The results showed that the major bioactive flavonoids found in Korean citrus peels were hesperidin, narirutin, didymin, and nobiletin. CPEs significantly attenuated H_2O_2-induced cytotoxicity in PC12 cells through antioxidant mechanisms involving activation of the Nrf2-ARE signaling pathway, reduction of intracellular ROS, prevention of GSH depletion, and upregulation of phase II enzymes such as HO-1 and γ-GCSc. Furthermore, CPEs suppressed tau hyperphosphorylation in HEK293 cells. Molecular docking analysis demonstrated that key citrus flavonoids—hesperidin, narirutin, and didymin—exhibited strong binding affinities to neurodegeneration-related target proteins. Collectively, these findings suggest that citrus peels could serve as valuable neuroprotective agents in functional foods and the pharmaceutical industry.

P5-69

Effect of leaves and pseudostem extract of *Curcuma longa* on IgE/BSA-stimulated mast cell activation and DNCB-induced atopic dermatitis in a BALB/c mouse model

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The present study investigated the effect of leaves and pseudostem extract of Curcuma longa (CLE) against type I allergic reactions in IgE/BSA-stimulated bone marrow-derived cultured mast cells (BMCMCs) and atopic dermatitis (AD) in DNCB-induced BALB/c mice. The results showed that CLE suppressed the degranulation of IgE/BSA-stimulated BMCMCs. CLE decreased the expression of FcεRI on the surface of BMCMCs and its IgE binding. CLE downregulated the production of the cytokines by modulating NF-κB and Syk-LAT-ERK-Gab2 signaling. CLE effectively attenuated the IgE/BSA-induced PCA reaction in BALB/c mice. Besides, the oral administration of CLE reduced AD symptoms, including skin dermatitis severity, transepidermal water loss, scratching, ear edema, and serum immunoglobulin levels in DNCB-induced mice. CLE decreased the inflammatory cell infiltration and spleen and lymph node enlargement. Also, CLE reduced expression levels of inflammatory mediators in the dorsal skin tissues, lymph nodes, and spleen. These results revealed the therapeutic potential of CLE against abnormal immune responses.