포스터 발표 논문 초록 PART Ⅰ

저장/포장/유통 분야

POSTER NO. P1-1~P1-32

P1-1

Changes in freshness of 'Ilpum' rice by different storage conditions and periods

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In this study, peroxidase was selected as a quality indicator to develop models for predicting quality changes in the consumption process of rice. Since the quality of rice is affected by the environment stored, temperature and humidity data and grain temperature were measured when sampling. By analyzing the enzyme activity of the samples, a database of enzyme content according to the environmental conditions was constructed. For the sample, commercial rice (variety: Ilpum) was purchased on February in 2021 and used as an analysis material. The samples were stored for six months in the different places including room temperature (RT) of apartment, Kimchi refrigerator, refrigerator, room temperature of grain storage warehouse, sample storage room. Analysis of peroxidase was quantified by substituting the enzyme activity value into the calibration with standard materials using Microplate Reader equipment. The enzyme content showed a decreasing pattern during the six months. There was a difference in the amount of enzyme depending on the stored environmental conditions. The amount of enzyme remaining during the storage period of six months was measured in the kimchi refrigerator (0.53 Unit/mL), refrigerator (0.37 Unit/mL), room temperature of grain storage warehouse (0.28 Unit/mL), sample storage room (0.20 Unit/mL), room temperature of apartment (0.17 Unit/mL). Since the amount of enzyme of storage locations with low temperature was higher than storage locations with room temperature, it can be seen that low temperature storage is necessary to maintain the freshness of the rice. Among the storage places, the kimchi refrigerator showed little change in enzyme content according to the storage period for about 2 months from March to May. Thus, the kimchi refrigerator is considered a suitable storage place to maintain the freshness of rice. In some conditions, the previous month's enzyme measured was less than the next month's enzyme measured, which is presumed to be cause by environmental factors such as the research site and so on. In the future, we are planning to construct an automatic collection system for environmental data using data loggers. If data is continuously accumulated in various varieties and conditions, it is expected that it will be possible to develop a quality change model.

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P1-2

Antimicrobial activity of chitosan-based ternary blend edible film incorporated with *Duchesnea indica* extract for strawberry application

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Antimicrobial and barrier properties of chitosan-based ternary blend film integrated with *Duchesnea indica* extract (DIE) were evaluated and its coating application was investigated in strawberries. An ethanolic extract from *Duchesnea indica* inhibited microbial growth against five food-borne pathogens in agar well diffusion test. Chitosan-based ternary blend film enriched with 5%(v/w) of DIE was prepared by the casting method. The composite film showed growth inhibitory effect of 4.7 log CFU/ml reduction against *S. aureus* in log reduction test. Water vapor permeability of the composite film was higher than those of the control film. Strawberries coated with the film forming solution were stored for three days at 25 ± 1 ˚C, 90 ± 2% RH. They showed 2.5-3.2 log CFU/g reduction on microbial growth against *S. aureus* after 24 h as the number of coatings increases. These results suggest that antimicrobial chitosan-based ternary blend films with DIE could be a promising food packaging material to ensure microbial safety.

P1-3

오리혈액의 건조방법에 따른 겔의 이화학적 및 기능적 특성 연구

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오리 혈액의 건조는 식품 안전성과 상업적 이점을 가져올 수 있지만 건조 방법마다 각기 다른 가공특성이 나타낸다. 건조 방법에 따른 오리 혈액의 가공적성에 미치는 영향에 대한 정보는 제한적이다. 본 연구는 다른 건조 방법이 오리 혈액으로 제조한 겔의 이화학적 특성 및 기능적 특성에 미치는 영향을 조사하는 것을 목적으로 진행되었다. 분무건조, 동결건조, 진공건조 및 열풍건조 공정을 활용하여 오리 혈액을 건조하였다. 각 건조방법으로 건조된 오리 혈액 분말을 증류수에 수화시킨 후 90℃에서 30분간 가열하여 겔을 제조하였고 4℃에서 24시간 방냉하였다. 동결 건조 오리 혈액 분말의 carbonyl content가 가장 낮았으며 열 안정성은 다른 처리구보다 높았다($p < 0.05$). 분무 건조 오리 혈액 겔에서 가장 낮은 malondialdehyde 함량을 나타내었다($p < 0.05$). 다양한 건조 방법을 통해 건조된 오리 혈액 겔의 색상은 각 처리구 사이 유의적인 차이를 나타내지 않았다($p > 0.05$).

동결 건조 오리 혈액 겔에서 높은 보수력, 경도, 검성, 씹힘성과 낮은 조리 손실을 보였으며 주사 전자 현미경을 통해 미세구조를 측정한 결과 다른 처리구보다 밀도가 높은 구조를 나타내었다($p < 0.05$). 본 연구 결과를 통해 동결 건조 공정을 통하여 건조한 오리 혈액 분말이 우수한 이화학적 특성과 가공 적합성을 보일 수 있음을 확인하였다.

P1-4

파프리카 저장 온도와 소포장방법에 따른 선도 유지 연구

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파프리카는 고급 채소로 국내에서 인식되어 이용되고 있으며, 2000년대 이후부터 일본과 같은 해외로 수출되고 있는 주요 원예작물로 중요하나, 국내에서는 수확후에 특별한 온도관리 없고 포장도 미흡한 실정이다. 이에 국내 현황을 감안하여 파프리카 온도별 포장에 따른 효과를 검토하여, 파프리카 선도 유지를 위한 기본적인 자료를 얻고자 수행하였다. 파프리카 저장·유통 시의 상품성 보존과 효과 검토하고자, 파프리카 적색과인 '시로코'를 이용하여 5℃의 저온과 20℃의 상온에서 PET, PP필름, 무포장과 같은 포장방법에 따른 외관변화와 생체중량감소 등의 품질 특성을 검토하였다. 본 연구에서의 파프리카 5℃와 20℃의 저장 조건에서의 PET, PP필름의 소포장과 무포장 등에 따라 선도 유지 정도를 검토하였다. 파프리카 수확 후 저장 동안의 선도유지 정도를 관찰하고자 생체중량감소, 외관변화, 경도 등을 조사하였다. 파프리카는 저장 중에 생체중량감소는 온도별 포장법에 따라 변화 양상은 유사하나, 증감 정도에 따라 차이를 보여 저장온도는 20℃의 상온에서 변화량이 크며, 포장은 무처리, PET 용기 순으로 차이를 보였다. 저장 중 경도나 당도는 큰 차이가 없었으나, 외관 변화에 있어서 온도의 영향이 큰 것으로 나타나 20℃의 상온에서 5℃의 저온보다 지수가 떨어지고 상품성 유지 기간이 감소하는 것으로 나타났으며, 포장법에 따라서는 상온에서는 큰 차이를 보이지 않았으나, 저온에서는 포장 여부에 따라 차이를 보였다. 국내에서 파프리카 저장·유통은 특별한 온도 관리없이 상온에서 이루어지고 있는데, 본 연구 결과 파프리카의 선도 유지를 위해서는 저온의 온도 관리가 요구되며, 온도에 따른 포장 관리도 달리해야 하는 것으로 판단된다. 본 결과를 통해 파프리카의 선도를 유지하기 위해 국내 저장·유통환경이 온도관리를 할수 있게 바뀌어야 하고, 포장의 개선을 통하여, 상품성 유지를 효과적으로 유지할 수 있을 것으로 보인다.

P1-5

수확 후 1-MCP처리가 단감 과일의 저장 중 품질변화에 미치는 영향

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말레이시아, 싱가포르, 베트남 등 동남아시아 시장에서 우리나라 단감의 인기가 점차 높아지고 있으나 중국, 스페인, 뉴질랜드 등에서 생산된 탈삽감과의 경쟁이 심화되고 있다. 우리나라에서 생산된 단감의 수출우위를 유지하기 위하여 에틸렌 작용억제를 기반으로 한 신선도유지제인 1-MCP(1-Methylcyclopropene)를 수확 후 처리하여 유통 중 경도, 색도 등 수출 단감의 품질을 유지하는 연구가 수행되었다. 단감에 1-MCP를 수확 후 처리하면 무처리군에 비하여 호흡량이 낮아지는 것을 발견하여, 본 연구에서는 '부유' 및 '태추' 단감에 수확 및 처리한 후 과일특성 및 유통조사를 실시하였다. 1-MCP 처리한 단감의 호흡량이 무처리에 비해 감소하는 경향을 보였고, 경도 등의 품질지표도 무처리군에 비해 오랫동안 유지되는 경향을 보였다. 이를 통하여 단감의 소비와 수출확대를 위해 1-MCP를 활용하는 것이 유리할 것으로 보인다.

P1-6

Quality Analysis by Treatment for Improvement of Glutinous Corn Storage

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Corn, along with rice and wheat, is one of the world's three crops. Since corn is not produced throughout the year, researches on storage properties have been steadily ongoing. This study analyzed pre-treatment - no-treatment bubble treatment, ozone water treatment, far-infrared ray treatment, UV+ far-infrared ray treatment- and post-treatment - UV treatment, infrared ray treatment, UV+ far-infrared ray treatment - for improvement of glutinous corn storage, Coliform count did not proliferate for 5 days in the post-treatment after steaming - UV treatment, infrared ray treatment, and UV+far infrared ray treatment - rather than pre-treatment before steaming. In particular, in the UV+far infrared ray treatment in the post-treatment, the growth rate of general bacteria was slower than that of the other treatment group. In addition, the UV+infrared ray treatment, which is a post-treatment, maintained a higher L value than the other treatment group despite the passing time, and the hardness was gradually lowered.

P1-7

Edible insect extracted hydrolyzed protein: Effects on structure and functional properties

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Insects are generally contained a large amount of protein, lipid, and chitin, and insect proteins are in the spotlight as food resources. Edible insect has a potential as a sustainable protein resources and extraction method has been used to process edible insect. However, residue fraction has been discarded after protein extraction because of poor functional properties of residue fraction, even residue fraction had higher protein components. This study was conducted to improve protein functional properties of residue and show effect of hydrolysis. Hydrolyzed edible insect residue was hydrated using different pH buffer. The changes in color values also showed significant difference by buffer and hydrolyze condition. Protein solubility was improved after hydrolyze and the highest value was observed in alkali condition. The protein molecular weight of hydrolyzed sample was distributed at low level. When compared protein functionality, foaming capacity and emulsifying capacity was the highest when extracted hydrolyzed protein acidic or alkali buffer, but higher foam stability was observed in alkali condition. This result might be due to increased unfolded protein structure. Thus, hydrolysis and extraction pH adjustment of edible insect protein can improve their processing aptitude as a food material.

P1-8

Quality characteristics of salted kimchi cabbage according to leaf density

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Picklingcruciferous vegetables in brine is well known as a method of preservation and flavor enhancement. In order to find out optimal salting condition, many previous studies were investigated at various temperature and salt concentrations. Most of the studies were limited to the physical treatment of brine, and there are no studies on the optimal salting condition according to

density of leaf in cruciferous vegetables. The purpose of this study was to prove that the leaf index (leaf density) is one of the most important factor in optimal salting cruciferous vegetables using a two cultivars Kimchi cabbages. The leaf index of Kimchi cabbages in spring cultivars (KCS)11.41 was higher than in winter cultivars (KCW)10.13. The KCS with high leaf density is less exposed than KCW at same concentration of salt solution. The permeability rate of salt solution into cabbage is 72.46 % in KCS and 85.07% in KCW, respectively. Also, leaf index of cabbage was affected on the change of total soluble solid, dehydration rate, firmness and salinity. The firmness and salinity of salted cabbage was increased as the leaf index decreased. And the change of total soluble solid and dehydration rate was increased with leaf index increasing. These results indicate that the leaf density is an important factor in optimal Kimchi cabbage salting condition.

P1-9

DBD 플라즈마 활성종을 활용한 양파 부패율 저감에 대한 연구

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2019년에 전 세계적으로 1억 2,400만 톤의 양파가 생산되었으며[1], 양파 생산량의 거의 40%가 수확 후 손실된다[2]. 이러한 손실의 이유에는 양파의 무게 감소, 썩음(10-12%) 및 발아(8-10%) 등이 있다[3].

이에 본 연구에서는 원통형 DBD 플라즈마 모듈을 사용하여 발생되는 플라즈마 활성종이 양파 저장중 양파의 부패율에 미치는 영향에 대해서 알아보고자 한다. 부패율에 대한 평가는 무게감소, 곰팡이 개체수, 외관으로 평가한다. 실험은 2℃로 유지되는 양파저장고에 원통형 DBD 플라즈마 모듈을 설치하고 플라즈마 모듈을 5분 중 10초 운전으로 24시간 작동시켜 플라즈마 활성종인 오존의 농도를 약 0.5ppm 정도로 일정하게 유지하게 했다. 약 2개월 동안 플라즈마 처리를 한 결과 대조군 양파에 비해 중량 감소가 22% 적었고, 플라즈마 처리된 양파의 곰팡이 개체수가 대조군 양파에 비해 약 3.5% 정도만 검출되어 대조군 양파 대비 부패율이 저감 됨을 확인 할 수 있었다.

P1-10

제조공정 및 포장이미지를 이용한 식품의 동일성 판단 기법

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최근 국내 제조 식품뿐만 아니라, 다양한 유통 경로를 통해 수입식품 및 다국적 OEM식품들이 폭넓게 보급되고 있으며, 소비도 증가추세이다. 이러한 수입 식품의 안전성 확보를 위하여 정부는 식품의 신고 단계에서 부적합 식품을 판별하고 있으나, 신고서 내 제조 공정이 다를 경우, 새로운 식품으로 식별되어 기존 부적합 식품이 유통될 우려가 있다. 이에, 본 연구에서는 인공지능 기술을 활용하여 신규 식품의 제조공정 목록과 기존 등록된 공정과의 유사성을 비교하여 동일성 여부를 판단을 돕는다. 또한, 일부 고의적인 제조 공정 변경을 시도할 경우에 대응하여, 식품 포장지 이미지를 동시에 비교하여 직관적인 동일성 판단 기준을 제시한다. 특히, 일반인이 이미지 획득(촬영)시, 사용하는 광학장비에 따라 이미지의 해상도, DPI(Dot per Inch), Bit Depth 등의 파라미터가 가변적이므로, 이들의 특성을 고려하여 동일성 판단 기준을 달리 설정토록 한다. 제안된 동일성 판단기준은 지수가중평균으로 계산되며, 일련의 적용 예시를 통하여 동일성의 판단 과정을 설명한다.

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P1-11

Selection of quality indicators and prediction of shelf-life of the meal-kit type chicken steak

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Consumption of HMR(Home Meal Replacement) is increasing due to the form of changed dining out consumption following the pursuit of convenience and the prolonged COVID-19. Chicken is one of the most consumed meat in Korea and has economic and nutritional advantages over other meat, but it needs proper distribution management because of its complex distribution process and inherent characteristics. Therefore, in this study, meal-kit type chicken steaks were stored at 5℃, 0℃, and -20℃ to evaluate the chemical and physical quality of the product according to the storage period, and select indicators with high

correlation among them to set the expiration date. According to the characteristics of the sample, the chemical quality index evaluated pH, VBN, and TBARS, and the physical quality index evaluated color(Lightness, Redness, Yellowness, △E value) and Texture profile analysis(hardness, springiness, cohesiveness, gumminess, chewiness). As a result of the experiment, VBN was selected as the most correlated index, and the calculated shelf-life and use by date of chicken steak were 2.73, 3.12 days at 5℃, 10.71, 12.24 days at 0℃ and 178.73, 204.26 days at -20℃, respectively.

P1-12

산지유통센터(APC)의 경영리스크 평가와 스마트 정보화에 관한 연구

이소진

지역농업네트워크 협동조합

농산물산지유통센터는 농업인이 생산한 농산물을 선별, 저장, 가공 등 일연의 과정을 통해 부가가치를 창출하는 시설로 산지유통 경쟁력 강화를 위한 핵심시설이다. 전국적으로 정부지원 사업자 446개소, 기타지원 222개소 등 총 668개소가 운영되고 있다. 그러나, 전체 농산물산지유통센터의 55.95%가 손실이 발생되고 있고, 44.6%가 60%이하의 가동률을 보이고 있는 실정이다. 기존 APC에 관한 연구들은 운영의 문제점과 개선방안을 제시함에 있어 통계자료를 활용한 정량적 분석에 집중되었다. APC 운영에 있어 리스크 발생요인이 다양화되면서 리스크 관리는 중요한 영역으로 대두되고 있는데 아직까지 APC 경영리스크에 대한 연구는 부족한 실정이다. APC 운영 프로세스 과정에서 발생될 수 있는 불확실한 리스크를 사전에 인식·평가하여 체계적인 대응 시스템을 상시적으로 작동시킬 필요가 있다. 본 연구는 APC 운영 전반에 걸친 경영리스크를 프로세스 관점에서 고찰하여 범주별로 그 리스크 요인을 분류하고 각 항목별로 영향도의 순위와 등급을 평가함으로써 영향도가 높은 과정에서 관리해야 할 정보화 영역을 제시하였다. 원물조달 단계, 선별 및 상품화 단계, 출하단계, 저장 및 재고관리 단계, 정산관리 등 다섯 단계별로 발생될 수 있는 경영리스크를 분류하고 5개 영역 27개 요인들을 FMEA(Failure Mode and Effect Analysis) 기법 분석모형에 적용하여 전문가를 대상으로 설문조사를 실시하였다. 각 리스크의 발생빈도, 검출도, 치명도를 7점 척도로 조사하여 각 리스크의 RPN(Risk Priority Number)을 평가하였다. 이후 RPN과 가중치를 고려해 리스크의 영향도를 정략적으로 분석하고 위험지수와 위험등급을 도출하였다. 5개 영역 중 원물조달 단계의 리스크가 가장 높은 위험등급으로 평가되었고, 해당 영역에서 집중적으로 관리되어야 할 정보는 정식일자, 계약면적, 계약품종, 계약물량, 출하예정일, 농가조직화 정보 등이 있었다. APC 입고 이전 원활한 원물조달을 위한 원물조달 관리 시스템을 구축할 필요가 있으며 APC 운영시스템과 연동시켜야 한다는 시사점을 도출하였다.

P1-13

하절기 파프리카 운송중 온습도 모니터링 및 MA 포장에 따른 선도유지 효과

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하절기 파프리카는 수확 후 높은 품온으로 운송 중 호흡률과 미생물 증식이 증가하여 상품성이 떨어지기 쉽다. 또한 소포장 유통이 최근 증가하고 있으나 파프리카 호흡특성을 고려하지 않은 포장재 사용으로 곰팡이, 물러짐 등 품질 저하가 발생하게 된다. 이에 본 연구에서는 하절기 파프리카 운송 중 온습도와 품질특성을 모니터링하고, 선도유지에 효과적인 MA 소포장 필름을 선발하고자 하였다. 전남 영암군에서 7월에 수확한 파프리카를 대상으로 전북 김제 APC로 운송되는 동안 온습도 변화를 모니터링한 결과, 수확 후 파프리카 품온이 31.5℃였고, 김제 APC까지 냉장운송이었으나 품온은 떨어지지 않았고, APC 도착 후 저장고에서 품온이 서서히 떨어지며 15.7℃로 낮아졌다. 7월은 전남지역 파프리카 수확이 거의 끝날 무렵이라 APC에서 다시 상온으로 택배 운송되는 경우가 많아 품온이 다시 상승함에 따른 품질 저하 발생이 우려된다. 또한 호흡량 증가, 결로 등으로 포장 내 물러짐이 발생하는데 본 연구에서 개선한 포장형태인 1개입 소포장 30um 두께의 미세천공필름 MPP 필름을 사용할 경우, 관행대비 중량감소 억제, 결로발생 억제 등으로 파프리카 품질이 양호하고, 신선함을 유지하였다. 하절기 파프리카는 동계작기 수확 마지막 시기로 전반적으로 과피 조직감이 낮아 미생물 침투 가능성이 높기에 수확직후 빠른 예냉처리로 품온을 떨어뜨려 호흡률을 낮추고, 저온으로 운송하며 APC 내에서 미생물 증식을 제어할 수 있는 처리기술과 온도관리가 필수라고 판단된다.

P1-14

The quality characteristics of low salt *Aralia elata Jangachi* using soybean suauce

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This study was carried out to examine changes in the quality characteristics of *Aralia elata* low salt *Jangachi* made with different blanching treatment time during storage at 4℃ for 8 weeks. *Aralia elata* was blanched with 100℃ hot water for 0~2 min. *Jangachi* sauce (JS) were prepared by adding soy sauce, vinegar, sugar, salt and water, and commercial soy sauce (CS) was used as a control. The pH showed a tendency to decrease as the blanching time increased, and JS showed a higher pH than CS. In the case of sugar content and total acidity, there was no significant difference according to blanching time, and CS showed higher sugar content and total acidity than JS. There was no difference in salinity according to the blanching time, and CS showed higher

salinity than JS.

P1-15

Self-venting bio-degradable blend films for microwave packaging applications

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In the food packaging industry, replacing petroleum-based plastics with biodegradable plastics has attracted attention from many researchers. At the same time, food packaging requires not only simply contain product but also additional function such as smart packaging and active packaging. Nowadays, the demand for Home Meal Replacement (HMR) is dramatically increasing since the increase in social phenomena such as in single-person households and COVID-19. HMR products have various cooking methods depending on their types, offering consumers various options. Notably, HMR using microwave cooking is considered a promising product by maintaing quality of food and giving convenience to consumers. However, there is a limit to the existing microwave packaging that must be opened before heating, which is due to the generation of high-pressure steam inside. The steam cannot be released through existing microwave packaging materials, causing burst and loss of food. Therefore, in this study, self- venting biodegradable blend films using nanoclay were produced by industrially feasible method. Herein, the applicability of films to microwave packaging were evaluated.

P1-16

영상 처리를 활용한 식품 이미지 데이터 증강 기법

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인공지능은 다양한 산업에 적용되어 사람들에게 편리함을 주고 정확한 정보를 사용자들에게 전달하고 있다. 특히, 카메라를 활용한 딥 러닝 이미지 검출 기술은 현재 연구가 활발히 진행되고 있다. 딥 러닝 기술에 필요한 이미지 데이터 셋은 다양한 환경 및 각기 다른 환경조건을 가진 촬영된 이미지가 필요하다. 정확한 검출을 하기 위해서는 많은 데이터들이 필요하며 실제 데이터들을 확보하기 위해 직접 촬영하거나 용역을 활용하는 등 노동력과 시간을 요구하는 단점이 있다. 본 논문에서는 딥 러닝 기술 활용하여 식품 정보를 소

비자들에게 제공하기 위하여, 이에 필요한 식품 정보 데이터를 영상처리기술로 데이터 증강(Data Augmentation)함으로써 소량으로 획득된 식품 데이터 양을 증가시키는 기법을 제안한다. 다양한 식품들은 각기 다른 포장지에 포장되어 식품마다 다른 특징을 가지고 있으며 컴퓨터가 포장된 식품을 분류하기 위해서는 촬영된 식품 이미지의 데이터의 밝기, 이미지 안에 위치, 방향 등 다양한 특성을 가진 이미지가 구성이 되어야 학습 후 검출 시 정확성이 높아진다. 따라서, 획득한 식품 데이터를 이미지 영상처리를 통해 회전, 필터 등을 적용하여 기존 이미지와 다른 다양한 형태와 각기 다른 특징을 가지는 이미지들을 생성하며 많은 식품 데이터를 확보하는 것을 입증하였다. 향후 연구로는 제한된 식품 데이터를 증강하여 정확하고 효율적인 식품 정보 학습을 진행하여 신경망 설계를 통해 딥 러닝 기반 이미지 검출 기법을 연구할 예정이다.

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P1-17

Synthesis of antibacterial calcium oxide nanoparticles prepared from eggshell wastes

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Calcium oxide (CaO) as a potent antimicrobial agent can be prepared from bio-wastes eggshells. To this end, the sol-gel method has been employed to synthesize nanoparticles owing to ease of preparation and affordability. In this context, the calcium carbonate ($CaCO_3$) as the major component of the eggshell was converted into calcium chloride ($CaCl_2$) using HCl. Subsequently, NaOH was added dropwise to the solution to form calcium hydroxide ($Ca(OH)_2$) precipitants. The resultants were collected using a centrifuge and washed using ethanol and DI-water. The washed samples were calcined at 900 ˚C for 6 h to obtain CaO nanoparticles. The dropwise addition of NaOH was controlled at the rates of 5, 10, 20, 40, 130 ml/min to evaluate the effects of dropping rate on the size and shape of nanoparticles. Afterward, the morphology and chemical structure of CaO nanoparticles prepared via different dropping rates of NaOH were investigated using fourier transform infrared spectroscopy (FT-IR), and X-ray diffraction analysis (XRD), and scanning electron microscope (SEM). In addition, the antimicrobial potency of each type of nanoparticles was evaluated to identify the effects of shape and size on the antimicrobial properties, in which results were compared with commercial CaO nanoparticles, CaO microparticles,

and $Ca(OH)_2$ to evaluate the biocidal efficacy.

P1-18

Quality change and evaluation in cold storage of fresh-cut fruits purchased from online and offline markets

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This study evaluated the microbial and physicochemical factors affecting the quality change during storage period for fresh-cut fruits sold in online and offline markets. Samples of melon, pineapple and mixed fruit were purchased and stored at two temperatures (10, 18℃) for 9 days. And samples were taken every 3 days, and physicochemical (pH, hardness, Hunter color) and microbiological (total aerobic bacteria (TAB), fungi, psychrotrophic bacteria (PB) and lactic acid bacteria(LAB)) analysis were performed. In the three types of fruits, pH and hardness were mostly decreased in the samples on days 6-9 compared with day 0, and no significant change in Hunter color was observed. In the case of fresh-cut melon, the number of TAB, PB and LAB increased to 7.4, 7.5, and 7.4 log CFU/g on the third day of culture, suggesting that PB and LAB led the spoilage of the melon. The number of TAB, PB, LAB and fungi in fresh-cut pineapple increased to 4.4, 6.2, 4.2, and 4.4 log CFU/g on day 3 of culture, suggesting that PB leads to spoilage of pineapple. The numbers of TAB, PB and fungi in the mixed fruit increased to 4.4, 6.7, and 5.5 log CFU/g on day 6 of culture, suggesting that PB and fungi lead the spoilage of mixed fruit. From the above results, since the shelf life of fresh-cut fruit is relatively short, it is considered that a careful review of spoilage-inducing microorganisms is necessary in order to extend the shelf life of the product.

P1-19

A study on the correlation between freshness factors of white rice

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The research was conducted to investigate the correlation between white rice's freshness factors by temperature of the storage and storage period. The samples were stored in temperature of four levels(5℃, 15℃, 25℃, 35℃)and were measured for fat acidity, seed viability(TTC), activation of peroxidase, and reducing sugar every week. As storage period increases, fat acidity continues to increase, also it reaches its highest value of 47.74(KOH/100g) at 35℃ and lowest value of 16.34(KOH/100g) at 5℃. After the 6 week storage, the seed viability through TCC showed a low rate of decline of 89% at 5℃ and a high rate of decline of 0% at 35℃. The activation of peroxidase showed the highest value of 0.13 at 5℃ and lowest value of 0.1 at 35℃ after 6 week. The analyzed results of correlation of each sample show the highest correlation coefficient of 0.8799, and coefficient determination of 0.7743. The correlation coefficients of seed vitality with activation of peroxidase and fatty acid were shown 0.8771, 0.8549, and each of the coefficient determinations were shown 0.7695, 0.7308. Therefore, this research shows that there is a significant correlation between the change in seed viability and fat acidity, and activation of peroxidase which are the freshness factors of white rice.

P1-20

폴리케톤 기반 고차단성 다층필름의 식품 저장 연장효과

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이 연구의 목적은 본연구팀이 개발한 폴리케톤 기반 고차단성 다층 필름의 식품포장재로서 적용가능성을 확인하는 것이다. 대상 식품으로는 된장을 선정하였고, 저장 기간 동안 된장의 외적인 변화를 통하여 저장성 연장의 효과를 확인하였다. 연구에 사용된 필름은 폴리케톤 기반 다층필름(POK, 두께 100μm, barrier층 두께 5μm), PE/PET 다층필름(두께 136μm), EVOH 기반 다층필름(EVOH, 두께 100μm, barrier층 두께 7μm)이었고, 각 포장재는 20cm×20cm 로 절단하여 사용하였다. 각 포장재에는 된장을 500±3g씩 충진하여 밀봉하였고, 10℃, 25℃, 25℃/RH 80%, 37℃에서 저장하면서 변화하는 외관적 품질을 평

가하였다. 포장재질에 따른 산소투과도는 PE/PET, EVOH, POK가 각각 140.79, 0.71, 0.99 cc/m2/day를 나타내었다. 저장기간에 따른 된장의 외관적 품질변화는 R, G, B, L, a, b, hue, chroma 값으로 확인하였고, 각 품질지표간의 상관관계를 분석하였다. 25℃와 25℃/RH 80%의 경우, R, G, B, L, a, b 값에서 POK와 EVOH의 변화량은 유사하였으며, 이들은 PE/PET에 비해 외관적인 변화가 적게 나타났다. 특히 25℃에서 저장한 L값의 경우, PE/PET는 저장초기 대비 34.5% 감소하여 변화폭이 크게 나타났으나, POK와 EVOH는 각각 24.5%, 22.3% 감소하여 변화정도가 유사하였으며, PE/PET에 비해 변화량이 유의적으로 적게 나타났다. 37℃는 저장기간에 따라 모든 처리구의 값이 크게 감소하여 저장초기 대비 외관적인 색변화가 두드러졌으며, 특히 PE/PET의 변화가 가장 크게 나타났다. 각 품질지표간의 상관관계는 저장온도가 높을수록 L값과 b값의 상관성이 높게 나타났으며, 저장온도에 관계없이 hue값과 b/a값, chroma값과 b값의 상관성이 높게 나타났다. 본 연구의 결과, 개발된 POK 기반 고찬단성 다층 필름은 외관적 품질변화 측면에서 저장온도와 습도에 관계없이 EVOH 기반 다층필름과 유사한 효과를 나타내었으며, PE/PET 다층 필름보다는 다소 우수한 효과를 보여주었다. 이를 통해 개발된 POK 기반 다층필름은 산소와 습도 차단이 필요한 된장을 비롯하여 유사한 조건이 필요한 다양한 식품군의 포장재로써 적용가능성이 크다는 것을 확인하였으며, 수입에 의존적인 EVOH 필름의 대체 가능성도 확인하였다.

P1-21

Effects of packaging methods on freeze-thawing characteristics of passion fruit

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This study was conducted to investigate freeze-thawing characteristics of passion fruit(Passiflora edulis) packed using three different packaging methods. These methods included vaccum packaging(VP), packaging containing glycerol(GP) and air packaging(AP). Raw passion fruit were packed with poly ethylene film, frozen to by immersion liquid freezing(-40℃) and then stored for 30 days at -20℃. Frozen passion fruit were thawed at 17℃ using running water to 4℃. The freezing time, thawing time, drip loss and quality attributes of frozen and thawed samples were analyzed. The freezing time required for the core temperature to reach -18℃ was 296.67 min(AP), 233.34 min(VP), and 175 min(GP), respectively. The vaccum packaging had a much stronger influence on increase of thawing time compared with AP and GP. There was no significant differences in drip loss of thawed samples by packaging methods, whereas

hardness were lower in the order of AP, GP, and VP. Principle component analysis(PCA) of data using the electronic nose showed that VP had the most similar flavor to fresh fruit. These results suggest that the freezing-thawing speed and quality of passion fruit may be affected by packaging methods.

P1-22

Quality change and evaluation in cold storage of fresh-cut vegetables purchased from online and offline markets

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This study evaluated the microbial and physicochemical factors affecting the quality change during storage period for fresh-cut vegetables sold in online and offline markets. Samples of lettuce, romaine and mixed vegetables were purchased and stored at two temperatures (10, 18℃) for 9 days. And samples were taken every 3 days, and physicochemical (pH, Hunter color) and microbiological (total aerobic bacteria (TAB), fungi, psychrotrophic bacteria (PB) and lactic acid bacteria(LAB)) analysis were performed. In the three vegetables, pH and Hunter color values were mostly decreased due to spoilage on day 6-9 of culture. In the case of lettuce-based vegetables, the number of TAB, PB and LAB increased to 6.6, 7.1 and 5.9 log CFU/g on day 6 of culture, and it is considered that PB and LAB led the spoilage of lettuce. In romaine-based vegetables, the number of TAB, PB and LAB increased to 7.6, 8.2 and 5.7 log CFU/g on day 6 of culture, and it is considered that TAB and PB led the spoilage of romaine. The mixed vegetables had a lot of early decay, and the number of general bacteria, low-temperature bacteria and lactic acid bacteria increased to 8 log CFU/g on day 3 of culture. As a result of identification of bacteria isolated from three types of vegetables, there were 72 taxa in 20 genera, and the main genera were *Kluyvera, Leclercia,* and *Pantoea.* From the above results, since the shelf life of fresh-cut vegetables is relatively short, it is considered that a careful review of spoilage-inducing microorganisms is

necessary in order to extend the shelf life of the product.

P1-23

Use of cellulose nanofibers (CNF) with a red radish color extract as a pH indicator packaging

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In this study, a biodegradable pH indicator that allows consumers to easily judge food quality changes was developed using cellulose nanofibers (CNF, 0.5-1.25%) as a support matrix and a red radish color extract (RRCE, 0.4-1.6%) as a dye which is non-toxic and has sensitive color reaction in various pH range. Through analysis of mechanical properties, solubility, sensitivity to ammonia, and Fourier-transform infrared spectroscopy (FTIR) of the prepared film, well-incorporations of RRCE into CNF were confirmed. Using 0.8% RRCE and 1% CNF, the freshness or spoilage status of the minced pork was monitored during 12 days storage at 4℃. In this result, because of the increase in total volatile base nitrogen value by increased psychrophiles, the color of the film was changed clearly enough to be easily distinguished with the naked eye. These results indicate that the films combined with CNF and RRCE have an excellent function and commercial value as a packaging material to detect changes in food quality.

P1-24

Hot water treatment reduces peel browning of oriental melon by modulating cutin metabolism

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Peel browning causes severe postharvest losses in oriental melons. In this study, the effect of hot water treatment on peel browning and shelf-life of oriental melon was studied. The melons were treated with hot water (45℃ or 5

0℃ for 5 min) and stored at 4℃ for 14 days, followed by 2 days at 20℃. The hot water treatment reduced the browning index of the yellow peel and white linear sutures of oriental melons during cold storage at 4℃. This effect was extended for two days at 20℃. Furthermore, the hot water treatment induced the expression of the cutin composition related genes, LeACS and CERs. Anatomical analysis revealed that deposition of cutin layer in hot water treated melons was higher than that of control fruits. At the metabolite level, hot water treatment significantly altered five metabolisms: fatty acid degradatio, cutin, suberine and wax biosynthesis, fatty acid biosynthesis, biosynthesis of unsaturated fatty acids, and linoleic acid metabolism. Our results suggest that hot water treatment prevent peel browning partly by inducing cutin deposition, resulting in improved storability and marketability of oriental melons.

P1-25

전처리 농산물의 소비 행태 및 유통 제품의 미생물 오염도 모니터링

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우리나라의 1인 가구가 급속히 증가하고 COVID-19가 장기화 되면서 소비자의 농식품 구매 행태가 변화하고 있다. 그 중 단순히 껍질을 벗기거나 세척, 절단, 건조 등의 간단한 처리를 거친 전처리 농산물에 대한 소비가 증가하였다. 전처리 농산물은 가공식품으로 분류되지 않기 때문에 생산자는 영업등록의 의무가 없으며 안전관리에 대한 기준이 명확하지 않다. 본 연구에서는 소비자 1,509명을 대상으로 전처리 농산물 구매 행태에 대한 설문을 진행하였으며, 구매 행태에 따른 유통 전처리 농산물(n=73)의 미생물 오염도 수준을 분석하였다. 조사 대상의 89.1%가 전처리 농산물을 구매한 경험이 있었으며 주로 세척/박피(82.3%), 절단(71.8%), 건조(56.6%) 형태의 전처리 농산물을 구매한 것으로 나타났다(복수응답). 주요 구매처는 대형마트(80.5%), 소형마트(47.2%), 온라인(33.0%), 재래시장(22.6%) 순이었다(복수응답). 구매처 별로 전처리 농산물을 구매하여 위생지표세균과 식중독세균(*Bacillus cereus, Staphylococcus aureus, Listeria monocytogenes, Escherichia coli, Salmonella* spp.) 오염도 분석 결과 재래시장에서 구매한 전처리 농산물에서 대장균군 수(1.37±1.5 logCFU/g)가 다른 유통경로에 비해 낮게 나타났으며 대형마트(4.34±2.55)에서 가장 높게 검출되었다($p<0.05$). 식중독세균의 경우 *B. cereus*가 14건의 농산물에서 검출되었으며 재래시장(7건)에서 가장 많이 검출되었다.

P1-26

Biorefinery application of rice husks and valorization of each process by-products

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Biorefinery processes composed of pretreatment, saccharification, fermentation, etc. cause quite a few by-products in each step. We suggest these by-products utilization can contribute to improve economical values. First, rice husk was subjected to pretreatment using microwave system with the conditions of 1% sulfuric acid, 15% solid loading, 190℃, and 5-60 min, following to separate into solid and xylose-rich liquor (about 6 g/L). Second, the produced solid was used for saccharification process using 20 FPU CTec2/g substrate, and resulted in the maximum enzymatic digestibility of about 65%. After then, solid and liquid were separated again respectively, and the liquid fraction was utilized for ethanol production with *Saccharomyces cerevisiae* D_5A, showing about 5 g/L of ethanol production capacity. The remaining solid was mechanically ground by a blender for 0-240 min, it was confirmed the possibility of lignocellulose nanofibers (LCNF) production. Further, the LCNF was applied to chitosan-based film, it was showed superior dispersibillity and increases of young's modulus and opacity.

P1-27

Analysis of packaging used for dried processed fruit/vegetable products in Korea

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In this study, the types and characteristics of packaging used for domestic dried processed fruit/vegetable products were investigated. The total number of reported items including processed fruit/vegetable and other agricultural products was 23,446 cases, of which the total number of dried processed fruit/vegetable products was 1,746 cases. The proportion of fruit ingredient (1,199 cases) were higher than that of vegetable ingredient (547 cases) in dried processed fruit/vegetable products. The mainly used ingredients were pome fruits (431 cases) in dried fruit products, and root and tuber vegetables (206 cases) in dried vegetable products. Dried-apple (220 cases) accounted for the

largest proportion of overall products. The samples (75 cases) were selected to analyze the characteristics of packaging used for dried processed fruit/vegetable products. The most frequently used packaging materials were as follows; polyethylene (PE, 81.25%) > polypropylene (PP, 6.25%) > polyethylene terephthalate (PET, 6.25%). The mainly used package type were as follows; stand-up zipper pouch (55%) > stand-up pouch without zipper (25%) > plastic pouch (15%) > bottle (5%). The highest in packaging thickness among the material was PET (1.945 mm), meanwhile the bottle (2.400 mm) was the thickest among the package types. The contact ratio of packaging was highest in the PE (22.07 cm^2/g) and plastic pouch (30.89 cm^2/g) among the packaging material and package type, respectively. These results can be used as basic data to figure out the packaging used for current dried processed fruit/vegetable products.

P1-28

Application of word2Vec algorithm to determine "the same imported food product from the same company" guidelines

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The guidelines of "the same imported product from the same company" (SIPSC) set by Korean government are being used to differentiate the imported food items. However, the determination of SIPSC is frequently confused by the terms of manufacturing process, sequence of the process, or miswritten process by the different importer. Therefore, an efficient and rapid method for determining SIPSC is urgently needed for implementing the new identification coding system.

Word2Vec algorithm is one of the most widely used models of word embeddings, searching for word-to-word associations and representing word data in vector numbers. Word2Vec algorithm was tested for determining SIPSC

in previous study. The goal of this study was to improve the efficacy of Word2Vec algorithm by applying both user weight and substitution to critical control point (CCP). When Word2Vec algorithm was applied to CCPs without modifications, the accuracy was approximately 70% as compared to the manual determination based on the cut-off value (0.85) of cosine similarity. The cosine similarity of user weight application was dependent on the CCPs; when the CCPs are shared (or same) in the processes, the cosine similarity increased, however when the CCPs were missed or not shared (or different), the cosine similarity decreased. However, when both user weight and substitution of the CCPs were applied, the cosine similarity was significantly increased. Therefore, this research suggests that Word2Vec algorithm can be used as a rapid method to determine SIPSC for imported food items.

P1-29

Effect on quality factors during the distribution of stored 'Fuji' apples at room temperature

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'Fuji,' the main cultivar of apples grown in Korea, is mainly distributed after long-term storage at low temperatures. This study identified the environmental conditions during the distribution of stored apple 'Fuji' sold in major markets and confirmed the correlation between the two factors through physicochemical and sensory investigations on the quality that changes during the room temperature distribution period. Apples stored for 6 months at low temperature (0 ± 1℃) were examined for quality at room temperature (23) for 7 days. Physicochemical quality was evaluated in terms of respiration rate, ethylene production, color, firmness, SSC, titratable acidity, sugar acid ratio, water content, and fruit juice. For sensory quality, preference (harmony of sugar acids), sweetness, acidity, crispness, and off-flavor were evaluated, and quality factors considered necessary when purchasing stored apples were investigated through consumer panel tests. The respiration rate of apples stored for 6 months was 15-20 mg CO2/kg·hr, ethylene production was 5-10 ng C2H4/kg·hr, hardness was 50N (Φ10mm), chromaticity was CIE L*, a*, b* 45, 25, and 15, respectively, and SSC was 13.5oBrix, titratable acidity was 0.2%, water content was 85%, and the amount of juice was 55%. Among the initial quality factors

stored at low temperature, the factors with significant changes during storage at room temperature for 7 days were observed as respiration, ethylene, weight loss rate, titratable acidity, and sugar-acid ratio. In the results of the sensory test, the factors having a positive correlation ($p<0.05$) with preference were sweetness ($r=0.83$) and crispness ($r=0.66$) and showed a negative correlation with pH ($r=-0.44$). The factor that consumers mainly consider when choosing stored apples is taste, and the main factor that determines taste is sugar content > sugar-acid balance > texture > fruit juice = aroma.

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P1-30

Effect of cultivation area and cold storage period on the quality of 'Fuji' Apples

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'Fuji', the main variety of apples grown in Korea, is stored at low temperature (0 ± 1℃) for a long-term period (6 to 8 months) before distribution. The quality of apples by main producing region was compared with the quality of apples grown in Cheongsong and Gunwi in Gyeongsangbuk-do and stored for 6 months. In addition, by comparing the quality of apples grown in Cheongsong and stored for 6 or 7 months, the major factors affecting the quality change were identified. Stored apples are measured by measuring the major quality factors, such as SSC, titratable acidity, sugar acid ratio, hardness, moisture content, fruit juice, color (CIE L*, CIE a*, CIE b*, Hue angle, Chroma), respiration rate, and ethylene production. The quality was compared according to the cultivation area or storage period. As a result of the significance test through the T-test, apples grown in Cheongsong and Gunwi showed significant differences ($p<0.05$) in sugar content, sugar acid ratio, respiration rate, and color. On the other hand, the factors showing a significant difference ($p<0.05$) for the storage period of 6 or 7 months were sugar-acid ratio, hardness, moisture content, and color. Chromaticity is a factor affected by the cultivation area and storage period, whereas hardness and moisture content were investigated as quality factors mainly affected by the environment during the storage of apples.

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P1-31

도라지 플러그 묘 온실 육묘 시 상토조성에 따른 생육 비교

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도라지는 약재와 식품으로 다양하게 사용되고 있으며, 최근 코로나 19 등 질병에 대한 노출이 지속되면서 호흡기 질환에 도움이 되는 도라지 수요가 증가하고 있다. 온실 육묘 시 직파보다 발아 기간 및 본포 정식 시기를 앞당길 수 있다. 본 연구에서는 상토조성에 따른 플러그 묘의 생육 비교를 통해 농가에 건강한 묘를 공급하고자 본 시험을 수행하였다.

도라지 종자는 2020년 10월 하순에 경상남도농업기술원 약용자원연구소 시험포장에서 수확한 종자를 사용하였다. 종자는 3월 21일 파종하였으며, 파종 전 물에 8시간 침지한 다음 물기를 제거하여 15시간 냉장 보관 후 128공 플러그 트레이에 파종 하였다. 상토조성은 원예용상토 100(T1), 원예용상토 80+버미큘라이트 20(T2), 원예용상토 60+코코피트 20+마사토 20(T3), 원예용상토 60+코코피트 10+마사토 10+버미큘라이트 20(T4), 코코피트 60+펄라이트 40(T5), 코코피트 60+펄라이트 20+버미큘라이트 20(T6)으로 조성한 다음 60일간 육묘 후 생육을 비교하였다. 그 결과 T2 처리구가 초장(8.8cm), 엽수(11.3매/주), 경경(1.84mm)으로 생육이 가장 우수하였으며 또한 엽록소 함량(25.9%)과 생체중 지상부(0.62g/주)도 높게 나타났다. T5 처리구는 초장, 엽수, 경경, 근장, 근경, 엽록소함량, 생체중 모두 가장 낮게 조사되었다.

따라서 온실 육묘에서 플러그 묘의 상토조성 비율은 원예용 상토 80%에 버미큘라이트 20% 조성으로 했을 때 수분 보유력과 생육이 우수하여 약용 재배 농가에 우량 플러그 묘를 공급할 수 있을 것으로 판단되었다.

P1-32

Comparison of flavor and marketability by fresh-cut fruits combination

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Recently the fresh-cut market is increasing, there is a lack of research on fruit combinations for high quality. Therefore, in this study, e-nose analysis for

various fruit combinations was conducted to investigate the patterns of flavor and odor during storage by fruit combinations. Fresh-cut apple, orange, cherry tomato, and shine muskets were stored singly of in combinations. The flavor patterns by fruit items were showed a clear difference. The content of isoamyl acetate in apples, limonene and beta-phellandrene in oranges, 1-hexanol in cherry tomatoes, and methyl acetate and pentyl butanoate in shine muskets were high. According to the type and number of two or three types of mixtures, there was a difference in the flavor pattern after 5 days of storage. In the treatment containing orange, a lot of substances analyzed in the orange alone treatment. In addition, the higher the mixing ratio of cherry tomatoes, the higher the CO2 and odor. Through the results, it is judged that fresh-cut will be helpful in improving the quality by identifying the change in flavor by mixing of fruits and selecting an effective combination for maintaining freshness.

포스터 발표 논문 초록 PART Ⅱ

가공/품질 분야

POSTER NO. P2-1~P2-74

P2-1

IRG 품온 상승 억제 및 예건용 시험장치 성능 시험

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그동안 호밀 중심이었던 국내 풀사료 재배는 사료 가치가 높은 이탈리안 라이그라스(IRG) 위주로 바뀌고 있다. IRG는 초기 생육이 우수하고, 가축 기호성이 매우 좋아 사료 가치가 높은 특성을 가진다. 실제 IRG 재배 면적은 2018년 15만 2천 ha로 동계 사료 작물 중 차지하는 비율이 70%로, 2015년 9만 3천 ha에 비해 약 63% 큰 폭으로 증가하였다. IRG 재배 면적 증가에 반해, IRG 수확후 건조에 한계가 있어 종자 수급에 어려움을 겪고 있다. 수확 직후 IRG 종자는 호흡대사로 급격하게 품온이 상승하는데. 건조를 위해 비닐하우스와 같은 비가림 시설까지 이동 시 종자가 뜨는 현상이 발생한다. 이를 방지하고자 종자를 비가림 시설 내 바닥에 얇게 펴 주기적 교반을 하는 데 많은 인력과 시간이 소모되고 있다.

본 연구에서는 인력 대체가 가능하고 빠른 시간 내에 품온을 낮추어 종자 품질을 유지하고자 'IRG 종자용 품온 상승 억제 및 예건용 시험용 시험장치'를 개발하여 성능 시험을 수행하였다.

실험에 사용된 IRG 종자의 초기 품온은 36.8℃, 함수율은 47.08%였다. 시험장치의 성능을 시험하고자 적재된 종자의 깊이별로 온도 센서를 설치하였으며, 데이터 로거를 통해 실시간으로 품온 변화를 측정하였다.

수확 직후 IRG 종자를 그대로 방치했을 경우 40분 만에 45.2℃까지 급격하게 품온이 상승하였으며, 장치를 켠 후 1시간 이내에 26.6℃까지 품온 약 41%가 감소하였다. 센서 깊이별 품온 저하는 큰 차이가 없는 것으로 보아, 적재함 내부에 송풍이 균일하게 됨을 확인하였다. 함수율은 3시간 후 41.54% 약 6%가 감소하여 수확 직후 종자의 호흡열을 빼앗아 품온을 낮춤으로써 예건의 효과도 있음을 알 수 있었다. 반면에 관행으로 건조한 경우, 종자의 품온이 50℃까지 급격하게 상승하여 종자가 뜨는 현상이 발생하였다.

IRG 종자 품온 상승 억제 및 예건용 시험장치 성능 시험 결과에 따르면 장치를 활용함으로써 빠른 시간 내에 종자의 품온을 낮추어 종자의 품질 손상을 막을 수 있을 뿐만 아니라 1차적인 예건을 통해 추후 효율적인 IRG 종자 건조가 가능할 것으로 생각된다.

본 연구는 농촌진흥청 어젠다사업(과제번호: PJ01477501)로 수행되었음.

P2-2

동결건조 간편식품의 재수화 분산안정성 증진을 위한 전분류 열처리 호화과정 중 균질처리 조건검토

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일반적인 동결건조 식품은 보존성과 재수화 복원성이 우수하나, 전분류를 바인더로 사용하여 블록 형태로 제조한 동결건조 식품의 경우 기대 이하의 재수화 분산안정성을 나타내는 경우가 많아 이를 개선하고자 하는 산업계의 요구가 높다. 동결건조 블록의 재수화 분산안정성은 전분의 종류 및 열처리·냉각(전분호화 및 재결정) 조건에 큰 영향을 받을 것이라는 가정하에 본 연구에서는 바인더의 열처리 호화과정 중 적절한 균질처리를 통해 동결건조 블록의 재수화 분산안정성을 높이고자 하였다. 바인더로는 산업에서 보편적으로 사용하고 있는 malto-dextrin, potato starch와 rice flour를 혼합하여 구성하였다. 각 소재의 습식 DSC결과를 바탕으로 호화개시 예상지점과 최대호화 예상지점을 예측하여 열처리 조건을 설정하였고, 열처리 과정 중 다양한 조건(균질처리 시기, 균질속도 및 바인더의 농도) 별 바인더 혼합물의 점도 변화와 제조된 동결건조 블록의 제형안정성 및 재수화 분산안정성을 측정하였다. 그 결과, 바인더 혼합물 농도 14.5-21.8%, 호화개시 지점부터 5,000 rpm 이상으로 균질처리를 시작하여 혼합물의 점도가 일정하게 유지되는 지점에 종료하는 것이 블록의 재수화 분산안정성을 미처리 대조군에 비해 현저하게 높일 수 있었고, 이 때 제형안정성 또한 대조군과 유사한 수준으로 나타났다. 결론적으로, 동결건조 블록 제조 시 열처리 혼합과정에서 바인더의 적절한 균질처리는 동결건조 블록의 재수화 분산안정성을 향상시킬 수 있는 것으로 판단되었다.

P2-3

Effects of plant cell wall-degrading enzyme treatment and yeast fermentation on the antibacterial and antioxidant activities of green tea extract

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The phytochemicals from plant leaf that possess physiological benefit, such as phenolics and flavonoids, are mostly secondary metabolites, which are synthesized in the plant cells in mesophyll site. Since these metabolites are only excreted out of the plant cells when exposed to pathogens, destruction of the cell wall is required to obtain such inner compounds. In this connection, green

tea was treated with a cellulase-pectinase complex enzyme and fermented with *Saccharomyces cerevies,* of which the antibacterial and antioxidant activities were evaluated. The green tea extract (GTE) exhibited antibacterial activities against *Bacillus cereus* and *Staphylococcus aureus,* it was higher than those of an ethanol extract (EE) obtained by general solvent extraction. In addition, the EC_{50} value for DPPH radical scavenging activity of GTE also reduced, compared to that of EE.

P2-4

The rheological and thermal properties of organogel containing Tenebrio molitor (mealworm) oil for developing solid fat replacer in meat patty

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Tenebrio molitor larvae (TML) is a kind of edible insect that is attracting attention as a protein source and future food material that can reduce carbon consumption, but it is difficult in expanding the market due to consumer's negative perception. To overcome the difficulties, TML oil was extracted and re-structured by organogelation with candelilla wax (CLW) at the different levels and their rheological and thermal properties were investigated to elucidate their use as pork fat replacer in a meat patty. As a result, the hardness of oranogel with TML oil was increased with increasing CLW levels. The viscoelasticity of organogel with TML oil tended to decrease with increasing temperature, and the more the CLW level, the higher the viscoelasticity was observed. The highest melting point was observed in 10%CLW-organogel. When the pork fat was substituted by organogel, the hardness of the meat patty was decreased than control, and the cooking loss also showed decreased, showing a softer texture. In the sensory results, overall acceptability was not significantly different between the samples and control. Therefore, the replacement of pork fat with organogel containing TML oil is expected to develop the meat products by reducing saturated fatty acid and without quality loss.

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P2-5

The structural, rheological, and thermal properties of oleogels with insect oil: Beeswax and glycerol monostearate interactions towards *Tenebrio molitor* larvae oil

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Edible insects are a primary potential future food because they contain high-quality protein and various micronutrients and have environmental and economic benefits. Although the lipid composition of edible insects was known to have high unsaturated fatty acid contents, most of the research is focused on the utilization of proteins, and there are few studies using oils. Therefore, to utilize the insect oil in food application, the oil from *Tenebrio Molitor* larvae (TM oil) was extracted and used in preparing the oleogel. TM oil oleogels were fortified by incorporating beeswax (BW) and glycerol monostearate (GMS) and evaluated their structural, rheological, and thermal properties. As a result, The interaction between BW and GMS contributed to the strength of the oleogel structure. These results are related to the results that oil binding capacity also increased as the concentration of BW increased or GMS was added. Also, the result of FT-IR suggests that TM oil is physically solidified without changing chemical composition through oleogelation. For the XRD result, all samples showed 3 peaks at around 19°, 21°, and 23° of 2θ. In particular, when the concentration of the gelator was increased or GMS was added, a wider and sharper peak was shown. The addition of GMS or increased the concentration of gelator led to the increased melting point, and this result was consistent with the result of higher viscoelasticity as a result of temperature sweep.

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P2-6

Functional, microbial and sensorial properties of probiotic banana juice fermented by lactic acid bacteria

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Banana is one of the subtropical crops that have started to be cultivated in South Korea due to climate change. However, because domestic bananas do not use preservatives or pesticides, the shelf-life is very short and the browning easily occurs when heat treated. To suggest a promising alternative to this problem and to increase the utilization of domestic bananas, the banana was fermented through lactic acid bacteria to develop probiotic banana beverages, and their functional, microbial, and sensorial properties were investigated. The banana extracts were fermented by a commercial starter for 24 hr and mixed with water in different ratios (50%, 75%, and 90%). As a result, the pH was decreased, but the acidities were increased as the fermented extracts ratio increased. Antioxidant activities (DPPH, ABTS) and the total content of polyphenol and flavonoid were increased with increasing the content of the fermented banana extract. Lactobacillus counts in probiotic banana beverages were observed at 7.76, 7.92, and 7.96 log CFU/mL respectively. The preference for color, sweetness, and sourness was higher at the 75% concentration than in other samples, also the highest in overall preference. From this study, it can be concluded that banana extracts by the lactic acid fermentation are suitable for developing the probiotic beverage containing antioxidant activity.

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P2-7

The effect of xanthan addition on the quality of fish cracker

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As interest in health increases, various protein-enriched products such as

beverages, noodles, and snacks are commercialized worldwide. Especially, the snacks containing fish protein can easily provide the protein and be used as a substitute for a snack with high calories or carbohydrates. Since the quality of fish snacks is affected by the absorption of oil during the frying process, this study aims to improve the quality of the snack by reducing the absorption of oil. Hydrocolloids are hydrophilic polysaccharides used as edible films, coatings, and emulsifiers. Among them, xanthan was selected and added at different level (0%, 0.25%, 0.5%, 0.75%) in the fish snack formulation. The highest diameter and the lowest height of fish snacks were observed in 0.25% xanthan addition and the diameter was decreased and the height was increased with increasing xanthan concentration. The 0.5% xanthan addition showed the lowest fracturability and the highest hardness. Above 0.5% xanthan concentration significantly reduced the oil absorption. In conclusion, it was confirmed that the reduced oil absorption and the most crispy fish snack could be produced when 0.5% of xanthan was added.

P2-8

Characteristics of fermented pineapple extracts according to the types of lactic acid bacteria

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Climate change is affecting the growth, development, production, and quality of crops (fruits) cultivated in Korea. Recently, pineapple, one of the subtropical fruits, has begun to be harvested and sold in the domestic market. But, there were few studies to develop processing technology using domestic subtropical crops in the process of adapting to climate change. In this study, to expand the utilization and functionality of domestic pineapple, the pineapple was fermented by 4 types of commercial starter (LF, BL, SL, LL), and their chemical and microbial properties were investigated. The pH and sugar contents of all samples were decreased as the incubation time increased. Lactobacillus counts of all samples for 12h fermentation were observed above 9.3 log CFU/mL. The total polyphenol and flavonoid contents were increased by approximately 6 and 3 times compared to before fermentation, respectively. The content of organic acid was increased by a 25 fold after fermentation and the biggest change was

shown in LF and LL. This study showed that domestic pineapple extract is suitable for developing probiotic beverages by lactic acid fermentation and it may have good functional and nutritional qualities for human consumption.

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P2-9

찹쌀가루를 이용한 농산물 건조 부각의 제조 및 품질 특성

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건조부각은 농산물을 이용하여 식염으로 조미 후 찹쌀풀을 입혀 건조한 것으로 산업화된 전통식품이다. 성상에 있어서 튀긴부각과 함께 원물 고유의 색택과 향미를 가지고 있다. 본 연구는 바나나, 사과, 오렌지, 가지 및 무를 원료로 2 mm 두께로 절단하고 식염수에 침지후 탈염하여 열풍으로 건조한 건조원물, 찹쌀가루를 코팅하고 스팀처리하여 제조한 건조부각, 건조부각을 에어프라이어에 160℃, 3분 열처리한 튀긴부각 등 제조방법에 따른 특성을 조사하였다. 색택과 외관은 오렌지 건조원물과 건조부각은 변화가 없었으나 기타 원료에서는 건조부각이 건조원물에 비해 우수하였다. 그러나 오렌지와 무 튀긴부각의 경우 건조부각에 비해 색의 변화가 큰 것으로 나타났다. 부각 분말의 흡수율은 가공도가 증가한 튀긴부각>건조부각>건조원물 순이었으며 흡유율은 건조원물>건조부각>튀긴부각으로 나타났다. 색의 경우 건조원물, 건조부각, 튀긴부각에서 오렌지의 적색도(a값)이 각각 3.49, 3.92. 6.32로 증가하고, 백색도(L값)는 감소하며, 근채류인 무도 같은 경향을 나타내었다. 사과 부각의 총 폴리페놀 함량은 건조원물, 건조부각, 튀긴부각에서 각각 443.69, 199.69, 204.41 mg/100 mg분말로 가공도가 증가할수록 감소하였으며, 총 플라보노이드 함량도 같은 경향을 나타내었다. 따라서 이들 성분의 보충과 항산화 활성을 높이는 한편, 가공에 사용한 찹쌀가루의 영향으로 열수추출물의 혼탁으로 인해 측정 불가능한 결과는 추가 실험이 필요하다. 본 결과는 찹쌀가루를 이용한 건조부각이 농산물 원물의 저장성을 높이며 분산성이 좋은 분말 조제와 함께 식물성 기름에 튀길 수 있는 반제품의 제조가 가능해 농산물의 활용도를 증대시킬 수 있을 것으로 생각된다.

P2-10

딥러닝 이미지 분석 방법을 이용한 홍삼 등급판별

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본 연구는 홍삼의 등급을 판별하는 것을 목표로 홍삼 RGB 이미지를 딥러닝 방법으로 분석하였다. 시료는 전문가에 천(1등급), 지(2등급), 양(3등급), 등외 총 4등급으로 판별된 홍삼 RGB 이미지를 획득하였다. 획득한 이미지는 배경제거, CLAHE, morphology 등 전처리 과정을 거친 후 ResNet, DenseNet, VGG19, Inception, 3LM(3-Layer-Model) 총 5개의 딥러닝 모델을 사용하여 Epoch에 따른 정확도로 나타내었다. Epoch가 30일 때, ResNet 74.40%, DenseNet 80.53%, VGG19 81.73%, Inception 79.87%, 3LM 76.93%로 VGG19와 DenseNet이 정확도가 높았다. Epoch가 100일 때는 ResNet 77.87%, DenseNet 79.87%, VGG19 80.53%, Inception 72.80%, 3LM 73.87%로 30 Epoch일때보다 전반적으로 정확도가 낮았지만 DenseNet과 VGG19가 30 Epoch일때와 마찬가지로 가장 높은 정확도를 보였다. 따라서, 홍삼의 이미지를 판별하는데 있어서 DenseNet과 VGG19모델을 100Epoch보다 30Epoch의 적은 반복수로 학습시키는 것이 적절하다고 간주할 수 있다. 본 연구에서는 홍삼의 한쪽면 RGB 이미지로 딥러닝 분석 방법으로 학습하여 등급판별 가능성에 초점을 두었지만, 추후 홍삼의 앞뒷면 혹은 3D 이미지를 활용하여 분석하면 더 정확한 등급판별 결과를 얻을 수 있을 것이라 기대된다.

P2-11

Optimization of ultrasound-assisted protease degradation treatment on the extraction of rice bran protein

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Rice bran, a by-product, has a higher protein content than rice and has low irritation and good digestibility. However, it is difficult to extract due to strong aggregation and extensive disulfide bond cross-linking. In addition, even after extraction, it is difficult to apply processing due to its bitterness and low solubility. Therefore, an appropriate extraction method was selected using sonication and proteases(Neutrase, RBPN; Blomelain, RBPB; and Alcalase, RBPA).

First, the extraction yield increased from 37.9% of the control(unsonicated and unenzymatically treated) sample to a maximum of 74.5% after treatment. Extraction method using proteases had a very positive effect on solubility compared to normal rice protein(NRP). In terms of physical properties, foaming capacity was high in RBPN and RBPB, and emulsifying activity was the best in RBPB. And RBPB was the lowest in bitterness evaluation, which is a disadvantage of rice protein. Therefore, the extraction method using ultrasonication and bromelain not only increases the extraction yield, but also shows excellent physical properties and low bitterness, so it is considered an efficient extraction method.

P2-12

Effect of ultrasound on stability and quality of plant-based Rrice milk

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Plant-based rice milk, an alternative to milk, has poor emulsion stability due to its high starch content, which lead to results in phase separation during storage to form sediments. To solve such a problem, an experiment was conducted by applying the physical effect of ultrasonic treatment for time after manufacturing rice milk. After sonication, phase separation and sedimentation were quite stable, and dispersibility was also more stable. In addition, the sedimentation index decreased with the sonication time, and it was confirmed that the viscosity increased. The particle size, which is considered an important factor of stability, also showed a decrease in size. In addition, the total amount of soluble solids increased according to sonication, and in sensory evaluation, the longer the sonication time, the stronger the metallic flavor. In conclusion, sonication greatly improves the stability of rice milk. However, excessive sonication may result in high viscosity and flavor inhibition. Therefore, proper sonication can contribute significantly to improving the stability of rice milk while maintaining its quality.

P2-13

Quality characteristics and comparison of microbial community in traditional doenjang by aging period in gangwon province

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This study investigated the microbial community and quality characteristics of traditional soybean pastes (doenjang) based on the aging period in Gyeongnam province. The samples were collected from two regions in Gangwon Province(Chuncheon and Pyeongchang). Contents of moisture, salinity, pH, and acidity of doenjang after 240 days aging were 56.63~63.92%, 10.52~14.51%, 4.14~4.82 and 1.22~1.99%, respectively. Lightness significantly decreased over the aging period, while the redness tended to increase over the aging period. Yellowness was from 28.38~28.48 to 27.57~30.63. Reducing sugar content was from 1.47~2.97% to 0.21~0.45%. The amino-type nitrogen content increased from 114.56~243.48 mg/100 g to 624.25~674.28 mg/100 g. The ammonia-type nitrogen content increased from 24.81~63.90 mg/ 100 g to 241.71~275.50 mg/100g. B.cereus count was from 3.78~3.92 Log CFU/g to 3.87~4.09 Log CFU/g.

P2-14

Components of Spirits According to Various Distillation Methods

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The major aroma components of solid-state fermented made from sorghum were examined using three distillation methods: Atmospheric single-stage distillation, vacuum multi-stage distillation, and vacuum single-stage distillation. The alcohol content of the liquor solid-state fermented was 6.48%, while the total acid and amino acid contents were 0.40 and 0.80 g/100 mL, respectively, which were suitable amounts for producing spirits. The total ester content of spirits was highest when atmospheric distillation was applied. More specifically, the ethyl acetate content was 3.60-1.50 times higher than those obtained with vacuum-distillation methods. Atmospheric distillation also gave 1.80-1.47 times

and 2.30-2.22 times higher contents of ethyl caproate. The butyric acid content obtained with atmospheric distillation was 56.04 mg/L, that is, 2.28-2.25 times higher than those obtained using vacuum-distillation methods. The furfural content, a component of charcoal, was the lowest (15.43 mg/L) for the atmospheric distiller. There was no significant difference in the furfural content after applying the two vacuum distillers (25.44-21.09 mg/L). Therefore, in the distilled spirits, the ester content was highest when atmospheric distillation was applied, and the furfural content was highest when vacuum distillers were applied. These results suggest that the distillation method affects the content of aroma compounds in spirits.

P2-15

Study for silkworm larva movement monitoring using image processing

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Sericulture is an economically important insect breeding industry that can produce the origin fabric of silk. The fifth-instar silkworm larvae can become cocoon within 10 days so special care is required for disease-free, especially viral infections but it is labor intensive and requires long-term experience. Bombyx mori Nucleopolyhedrovirus (BmNPV) is one of the most susceptible viruses for silkworm larvae, causing significant economic losses. In this study, a movement tracking technique proposed based on image processing. A monitoring system obtains IP camera and environmental sensors (temperature, humidity) for 5 days. Image size of IP camera is 1080 × 1920, and its frame rate is 25 frames per second (fps). Silkworms usually move slowly and swallow mulberry leaves then sleep for a day with a full belly. In order to discriminate which one is the asleep larvae and dead one, long term monitor for 24 hours is necessary. To develop the larvae movement tracking algorithm, open source software for image processing was used such as OpenCV and Python. Changed the image size to 640 × 480 to reduce processing time. Moreover, YUV color space and Otsu algorithm were used to improve larval selection. Target selection was perfect in the YUV color space, but the Lucas-Kanade methods was obtained 28% ignorance of target larvae. Tracking of larvae movements is measured using the multiple instance learning (MIL) algorithm. Detection and

tracking of larval movement from a recorded video file, a rectangular bounding box was manually selected and x-y movement of were saved. Sericulture, or silk farming, is typical industry that labor intensive and time consuming. In this study, we developed larvae movement monitoring algorithm using image processing. Image processing has a big potential to monitor and reduce labor and time on practical breeding site.

키워드(Keywords) Silkworm larvae, Image processing, Movement monitoring

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P2-16

석류 농축액을 활용한 음료 베이스 개발

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본 연구는 석류 농축액을 활용하여 다양한 제품에 적용 가능한 음료베이스를 개발하고, 최적의 제조 조건을 수립하고자 하였다. 석류 농축액은 66 °Brix로 조정하였으며, 부원료로 적포도 농축액, 비타민C, 비타민B1, 비타민B_2, 구연산 및 스텐비텐을 사용하였다. 예비실험을 통해 석류 농축액 첨가량을 95%로 설정하였으며, 살균 시간은 10-20분, 온도는 70~100 ℃ 범위로 10 ℃ 간격으로 설정하여 품질특성을 확인하였다. 살균 시간과 온도에 따른 석류 농축액을 활용한 음료 베이스의 pH, 적정산도 및 당도는 유의적인 차이를 보이지 않았고, 색도는 살균 시간과 온도가 증가함에 따라 L, a 값은 높아지는 반면 b 값은 낮아졌다. 총균수는 70 ℃, 10분 살균 처리에서 1.48 log CFU/mL로 나타났으나, 그 외의 시료구에서는 확인되지 않았다. 관능평가의 경우 종합기호도에서 70 ℃, 20분 살균 처리 시료구가 6.80점으로 가장 높은 기호도를 나타내었다. 따라서 석류 농축액 활용 음료 베이스에 적합한 석류 농축액의 첨가량은 95%이며, 70 ℃에서 20분 살균 처리가 가장 적합한 것으로 판단된다.

P2-17

복숭아 퓨레 첨가량에 따른 복숭아 식혜의 품질 특성

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복숭아 (*Prunus persica* L. Batsch)는 장미과에 속하는 복숭아나무의 열매로 ester와 acetaldehyde 등이 함유되어 있어 독특한 향기를 가지며 β-carotene, zeaxanthin, cryptoxanthin 등의 carotenoid계, 비타민 A, C등 비타민이 풍부한 과일이다. 복숭아는 여름철 과일 중 선호도가 높지만, 보구력이 약해 잘 물러지고 저장성이 낮아 선도유지 기간이 짧다는 단점이 있다. 또한 기상에 따른 품질 변화가 심하기 때문에 복숭아 가격 안정화 및 부가가치 향상을 위해 다양한 가공기술 개발이 시급하다. 본 연구에서는 무처리, 2%, 4%, 8% 복숭아 퓨레 첨가량에 따른 복숭아 식혜의 품질 특성을 평가하기 위하여 이화학적 특성과 항산화 특성을 비교하였다. 복숭아 퓨레 함량이 증가할수록 당도는 유의적으로 증가하였고, pH는 유의적으로 감소하였다. 총산은 8% 복숭아 퓨레를 첨가한 식혜에서 유의적으로 높게 나타났다. 복숭아 식혜의 항산화 특성 분석 결과, 총 플라보노이드 함량은 무처리와 2% 처리구에서 유의적 차이가 없었으나 4%와 8% 처리구에서 149.50±6.73 ug/mL, 352.50±36.32 ug/mL로 증가하는 경향을 보였다. 총 폴리페놀 함량은 무처리와 2% 처리구에서 유의적 차이가 없었으나 4%와 8% 처리구에서 300.67±6.74 ug/mL, 334.93±11.90 ug/mL로 유의적 높은 함량을 보였다. 복숭아 퓨레 첨가량이 증가할수록 DPPH radical 소거능과 ABTS 활성은 높아지는 경향을 보였다. 특히 8% 처리구에서 DPPH radical 소거능과 ABTS 활성은 10.48±2.34%, 14.96±1.71%로 유의적으로 가장 높은 활성을 나타내었다. 이와 같은 연구 결과는 복숭아 퓨레 첨가에 따른 복숭아 식혜의 이화학적 특성 및 항산화 특성 연구와 복숭아 식혜 상품화에 기초 자료로 활용될 것으로 예상된다.

P2-18

Physicochemical properties and antioxidant activity of *Hovenia dulcis* fruit vinegar

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The fruit of *Hovenia dulcis* tree is widely used in East Asia and is also known as 'Jiguja' in Korea. This study was conducted to determine the antioxidant activity of *Hovenia dulcis* vinegar produced by two step fermentation. In the alcohol fermentation step, 6.43% alcohol was obtained at 30℃ for 6 days. On the second step, acetic acid fermentation was

conducted 6 days, and the total acidity reached 4.99%. Antioxidant activities were assessed in DPPH(2,2-diphenyl-1-picrylhydrazyl) radical scabenging activity, $ABTS^{\bullet+}$(2,2-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) radical scavenging activity, reducing power, SOD-like activity, hydrogen peroxide scavenging activity, β-carotene bleaching assay. The *Hovenia dulcis* fruit fermentation vinegar (HFV) showed higher DPPH radical scavenging activity, $ABTS^{\bullet+}$ radical scavenging activity, reducing power, hydrogen peroxide scavenging activity and β-carotene bleaching assay than *Hovenia dulcis* fruit extract (HE). The DPPH radical scavenging activities of HFV was 73.58%; $ABTS^{\bullet+}$ radical scavenging activity was 99.86%; reducing power (OD700) was 3.22; and hydrogen peroxide scavenging activity was 84.07%. Also, the HFV showed effective levels of β-carotene bleaching assay (93.29%). These results suggested that HFV exhibits significant antioxidant activity and it can be developed as functional food material.

P2-19

Changes of physicochemical properties during lactic acid fermentation of kiwi (*Actinidia deliciosa*)

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Kiwi (*Actinidia deliciosa*) is the most consumed fruit that contains a large amount of physiologically active substances such as vitamin C, folate and dietary fiber. Kiwi is used in various ways in food, but studies on kiwi fermentation are insignificant. In this study, optimal fermentation conditions using strains *Lactobacillus Plantarum* (LP) and *Lactobacillus Casei* (LC) and antioxidant effects according to fermentation were evaluated. The optimal fermentation conditions were identified with 20% kiwi LP broth fermented for 24 hr (CFU: 8.79 log CFU/g, pH: 2.83, the sugar content: 4.2 °Brix, 660 nm: 1.734, total acidity: 1.075%). The total polyphenol and flavonoid contents of 20% kiwi LP fermented drink (KLPFD) increased after fermentation to 107.9 ± 1.67 mg% and 43.66 ± 0.72 mg%. In conclusion, the total polyphenol and flavonoid contents of KLPFD can be increased through fermentation, and the possibility of KLPFD as a functional food material was confirmed.

P2-20

Optimization of manufacturing conditions for song-hwa mushroom sausage using response surface methodology

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With the needs for sustainable food, many researches on developing a meat alternative based on soybean, pea, and wheat proteins have conducted. Song-hwa mushroom (*Shiitake dermatitis*), one of the improved varieties of shiitake (*Lentinus edodes*), was considered to have an advantage for manufacturing Song-hwa mushroom sausage (SMS) in the aspect of texture, odor, and potential of allergic reaction. The objective of this study was to investigate the possibility of manufacturing SMS. In a previous study, the ratio of binding and thickening agents for binding Song-hwa mushroom particles were optimized by extreme vertices design. In order to obtain the optimum manufacturing conditions, response surface methodology was used in this study. As a result, the optimum conditions were determined to be a pressure of 4.41 MPa and a compression time of 38.48 min. And the model fit was evaluated by coefficient of determination (R^2=0.81) and F-test ($P<0.05$). SMS was manufactured under optimum conditions and compared with commercial sausages. There was no significant difference of the quality properties. In conclusion, the possibility of manufacturing SMS was confirmed and the additional research for sensory characteristics of SMS is thought to be necessary.

P2-21

α-amylase처리가 마젤리 조직감에 미치는 영향

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마는 위와 장을 보호하고 자양강장의 효과가 탁월하며 한방약재로 사용될 때는 산약이라고 불리는데 예전부터 식품과 약재로 사용되어 있다. 마에는 뮤신이라는 점액 물질이 매

우 풍부한데 뮤신은 단백질의 흡수를 촉진해 위벽의 분해를 억제하여 위벽을 보호하고 장내 윤활제 역할을 하여 이물질을 제거하는 등 위산과다와 소화성 위궤양 예방에 효과적이다. 시중에 유통되고 있는 마는 주로 장마, 단마, 둥근마인데 전분함량이 10%이상을 차지하여 젤리 제조 시 조직감이 양갱과 유사하게 되어 이를 개선하고자 α-amylase를 처리하고 조직감의 변화를 측정하였다. 젤리제재는 로커스트빈검, 카라기난, 펙틴, 젤라틴을 혼합하여 사용하였으며 젤리제재 첨가 후 80℃ 가열하여 혼합하였다. 조직감 측정을 위하여 Rheometer(Compac-100, Japan)을 사용하였으며 5mm 원형 탐침으로 분당 60mm의 테이블 이동속도로 측정하였다. 경도는 효소처리 결과 48.9g에서 43.3g로 감소하였으며 응집성은 2.1%에서 87.3%로 증가하였고 탄력성은 14.4%에서 98.1%로 증가하였다. 마를 이용하여 젤리를 제조할 때 마의 전분을 당화시키면 탄력성과 응집성이 증가되고 경도는 감소되어 젤리에 적합한 물리적 특성으로 개선할 수 있었으며 추출물이나 분말이 아닌 생마를 이용하여 마의 특성을 유지하며 가공적성을 증가시킬 수 있었다. 앞으로 조직감 개선뿐만 아니라 마의 기호성을 증가시킬 수 있는 첨가물 선발이 필요할 것으로 여겨진다.

P2-22

매실 절임가공 기계화를 위한 과육 및 설탕 계량 시스템 개발 및 성능 평가

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매실은 다양한 생리활성물질을 함유하고 있는 식품으로 피로회복, 항균활성 등에 효과가 있다고 알려있다. 주로 청, 주류, 음료 및 장아찌로 가공되며, 꾸준한 수요를 보이고 있다. 그 중 장아찌는 매실의 과육만을 사용하여 제조되며 세척, 탈수, 매실 씨 제거 및 과육절단, 계량, 포장 등 가공과정에 많은 인력과 시간이 소요되기 때문에 자동화 시스템 구축이 요구된다. 따라서 본 연구에서는 매실 절임 가공 전과정 기계화를 위해 절단 매실 및 설탕 자동 계량 장치를 개발하였으며, 과육+설탕(5, 10, 12 kg), 과육(3, 5, 7 kg) 및 설탕(2, 5 kg)의 무게에 따른 투입량의 반복성 및 정확성을 조사하여 작업 성능을 평가하였다. 과육과 설탕의 계량은 2개의 로드셀이 동시에 무게를 측정하여 평균값을 출력하다. 자동 계량 반복 시험 결과, 과육+설탕과 설탕 계량의 편차는 최대 ±80 g, 과육은 ±50 g으로 비교적 일정한 투입량을 보였다. 또한 설정값에 과육+설탕, 과육, 설탕 투입량은 각각 최대 99.1%, 99.3% 및 98.9%의 우수한 정확성을 나타내었다. 본 연구에서 개발한 과육 및 설탕 계량장치는 우수한 반복성과 정확성을 나타내어 현장 적용이 가능할 것으로 보이며, 과육 및 설탕 계량의 수작업을 대체하여 효율적인 매실 가공이 진행될 수 있을 것으로 생각된다.

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P2-23

섬쑥부쟁이 데침시 칼슘처리에 따른 이화학적 품질특성

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섬쑥부쟁이는 울릉도에서 재배되는 국화과 개미취 속 다년초로서 모양은 취나물과 비슷하게 생겼고, 울릉도에서는 부지갱이라고 불리어 진다. 이른 봄 새순을 잘라 식용하며 주요 효능으로 항경련, 진정효능, 항산화, 항염, 고지방 식이에서 지방흡수 억제 등의 효능이 보고되어 지고 있다. 섬쑥부쟁이는 생채로 판매하거나, 데침처리를 한 후 묵나물 형태로 건조, 냉동나물로 판매되어 지고 있다. 데침처리는 채소를 연화시키거나, 냉동 및 건조 제품의 전처리, 효소의 불활성화와 제품내 탈기의 목적으로 사용되어 왔으며, 데침 중의 색, 질감, 맛 및 향의 변화, 수용성 영양성분의 파괴, 기능성분의 유출 등의 문제로 인하여, 제품의 손실을 발생시킨다. 본 연구에서는 데침시 칼슘 처리에 따른 섬쑥부쟁이 나물의 이화학적 품질특성을 조사하여 섬쑥부쟁이 유용성분의 유출을 감소시킬 수 있는 데침조건을 설정하고자 하였다. 데침물의 칼슘처리 농도를 0~0.5%처리에 따른 외관, 데침물의 플라보노이드 함량, 항산화능을 비교하였다. 그 결과 칼슘처리 농도가 증가할수록 데침물의 플라보노이드 함량은 감소하는 것으로 나타났으며, 특히 칼슘 0.2% 이상 첨가시 데침물의 플라보노이드 성분의 유출이 감소되어짐을 확인 할 수 있었다. 칼슘처리 농도에 따른 섬쑥부쟁이 나물의 항산화능을 분석한 결과 처리 농도가 높을수록 항산화능이 유의적으로 증가함을 볼 수 있었다. 데침물에 칼슘처리 0.2%처리 후 데침시간에 따른 이화학적 품질특성을 분석하였다. 그 결과 데침시간 4분까지는 섬쑥부쟁이의 나물의 외관에서 색상 및 형태의 유지가 됨을 확인할 수 있었다. 데침물에 칼슘을 무처리 하였을 때는 데침시간이 증가함 따라 데침물의 플라노이드 함량의 증가를 볼 수 있었으나, 0.2%칼슘을 처리하였을 때는 데침물의 플라보노이드함량이 낮아서 성분 유출이 미미한 것으로 나타났다. 즉 섬쑥부쟁이 데침이 칼슘 0,2% 및 데침시간 4분이내 처리시 유용성분의 유출을 최소화 할 수 있으며 항산화 효과도 유지할 수 있음을 확인 할 수 있었다.

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매실 씨제거 및 과육절단 시스템 성능 평가

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매실 당절임은 세척, 탈수, 씨 제거 및 과육절단, 설탕 계량의 과정으로 생산된다. 그 중 매실의 씨와 과육을 분리하는 작업은 대부분 수작업으로 진행되어 많은 노동력과 시간이 소요된다. 따라서 본 연구는 노동력과 가공시간을 절감하고 효율적인 매실 당절임 제품 생산 시스템을 구축하고자 매실 씨 제거 및 과육절단 장치를 개발하였으며 과육회수율, 씨제

거율 및 파손된 씨 개수를 조사하여 작업 성능을 평가하였다. 매실은 2022년 6월에 수확한 전남 광양 매실로 옥영, 남고의 왕특과 왕왕특 등급을 구입하여 성능평가에 사용하였다. 작업 시 매실 씨 배출과 과육절단이 용이하게 하기 위해 매실 꼭지를 아래 방향으로 하여 정렬하였으며, 매실에 가해지는 하중을 고려하여 6개의 역방향 칼날을 사용하여 절단한 결과, 1회 시험(매실 40개 기준)당 옥영(왕특 및 왕왕특)의 과육은 최대 76.3%, 남고(왕특 및 왕왕특)는 78.7%의 수율을 보였다. 씨제거 과정 중 옥영(왕특 및 왕왕특)은 최대 7개, 남고(왕특 및 왕왕특)는 4개의 파손된 씨가 배출되었으며 씨제거율은 각각 최대 97.4%, 100.0%로 우수한 성능을 나타내었다. 본 연구에서 개발한 매실 씨제거 및 과육절단 장치는 현장 적용이 가능할 것으로 보이며, 자동화된 매실 전처리 작업으로 농가 소득 증가 및 소비시장 활성화에 기여할 수 있을 것으로 생각한다.

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P2-25

국내 다소비 두류의 조리 전후에 따른 비타민 B2 함량 비교

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다양한 영양성분 중 비타민 B2는 당 및 지질대사의 산화.환원 반응과 관련된 많은 효소 반응에 조효소로 관여하는 수용성 비타민이며, 비타민 B2 결핍은 성장기 아동에게 성장을 방해하는 요인으로 작용할 수 있다. 본 연구는 식품영양성분 DB 구축의 일환으로 국내 다소비 두류 6종의 조리 전, 후 함량을 분석하여 비교하였다. 시료는 완두, 강낭콩, 갈색 렌틸콩, 붉은색 렌틸콩, 병아리콩, 작두를 선정하였고, 생것과 삶은것을 전처리하여 균질화한 것을 추출하여 HPLC-FLD로 분석하였다. 비타민 B2 함량은 시료 100g 기준으로 생것의 경우 완두가 0.347±0.004mg으로 가장 높았고, 조리된 시료에서도 완두 삶은 것이 0.212±0.005mg으로 가장 높은 함량을 보였다. 붉은색 렌틸콩은 생것에서 0.194±0.005mg, 삶은 것에서 0.086±0.000mg으로 나타나 비타민 B2 함량이 적은 것으로 확인되었다. 두류의 조리 전후에 따른 비타민 B2 함량의 감소율을 30.70~74.06%정도로 나타났으며, 감소율이 가장 높은 것은 갈색 렌틸콩에서 가장 낮았으며, 작두에서 감소율이 가장 높게 나타났다. 본 연구 결과에 따르면 두류 6종 모두 생것에 비해 삶은것의 비타민 B2 함량이 감소하는 경향을 보였는데, 이는 조리과정에서 수용성 비타민이 일부 조리수로 용출되었기 때문으로 생각된다. 두류의 조리 전후 비타민 B2 함량을 정량함으로써 원재료와 조리된 시료의 영양정보를 비교할 수 있었으며, 이러한 결과는 외식, 급식, 조리가공품의 영양조사 기초자료가 될 것으로 기대된다.

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국내 다소비 곡류 가공품의 비타민 B2 함량 비교

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국가표준식품성분표에 수록된 비타민 등 미량원소의 영양소 데이터 확보를 위한 연구의 일환으로 국내 다소비 곡류 가공품의 비타민 B2 함량을 비교하고자 하였다. 본 시험에 사용된 곡류 가공품은 빵류(식빵, 크림빵, 야채호빵, 크림빵, 마늘빵, 호밀빵, 크로와상, 플레인 베이글, 바게트빵), 과자류(백미 뻥튀기, 김전병, 땅콩전병, 설병, 선과, 떡뻥, 약과, 바닐라 웨하스), 국수류(중화면, 스파케티면, 칼국수면, 쌀국수면)로 나누어 비타민 B2 함량을 분석하였다. 그 결과 빵류의 비타민 B2 함량은 0.024±0.001mg/100g~0.437±0.001mg/100g 범위로 나타났으며, 야채호빵에서 가장 낮은 함량을 나타내었으며, 팬케이크 가루 및 조리된 형태의 팬케이크가 함량이 높은 것으로 나타났다. 과자류의 비타민 B2 함량은 떡뻥에서 불검출 되었으며, 바닐라 웨하스에서 0.288±0.005mg/100g으로 가장 높게 나타났다. 국수류는 건면과 삶은면을 비교하였는데 쌀국수면에서는 불검출되었으며, 삶은면 중에서는 중화면이 가장 낮은 함량을 나타내었으며 스파게티면이 가장 높게 나타났다. 건면에서는 중화면이 가장 낮은 함량을 나타낸 반면, 칼국수면이 가장 높은 함량으로 나타났다. 조리에 따른 영양소 감소율은 중화면에서 가장 높았으며 스파게티면에서 감소율이 낮은 것으로 나타났다. 이러한 결과는 식품자원의 영양조사 기초자료가 될 것으로 기대된다.

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클로로겐산 함량증진 효소추출 사과 차음료 생산 공정 개발

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과실류의 가공은 가공에 의한 과실의 연중 소비를 통한 과실가격 안정화로 생산자 및 소비자를 보호할 수 있으며, 과실의 가공처리에 의한 고품질화를 통해 부가가치가 증대될 수 있다. 과실의 가공기술은 과실 재배 농민과 소비자를 동시에 보호할 수 있는 기반 기술로서 과실 가공산업의 활용범위를 크게 확대하는 것은 물론 다른 농산물에도 적용이 가능한 잠재력이 큰 기술로 주로 주스, 잼, 술, 음료 등으로 개발되고 있다. 그러나 국내외 소비자들의 식품 소비 트랜드가 급격하게 변화하므로, 기존의 가공기술을 개선시키거나 전혀 새로운 개념의 가공공법으로 소비자의 욕구를 충족시킬 수 있는 차별화된 가공기술 개발이 필요하다. 사과는 국내에서 생산되는 주요 4대 과실류 중 하나로서 기호도가 높아 대부분 생과의 형태로 소비되어 왔으나 근래에 이르러 기후변화, 농가 고령화, 공급과잉과 시장개방에 따른 수입품과의 경쟁으로 새로운 가공기술 개발이 절실히 요구되고 있다. 이

에 효소적 기법을 활용하여 사과의 클로로겐산 함량 증진을 통한 비만개선효과를 갖는 사과 식음료 가공 생산 공정기술을 개발하고자 한다. 효소적 기법이란 추출과정에서 새로운 형태의 기능성 물질 생성과 비수용성 물질의 수용성 전환으로 기능성 및 추출효율을 높이고 용매추출에 비하여 안전성이 높다는 장점이 있으므로 사과에 함유된 불용성 성분을 가용화시키고 동시에 클로로겐산을 비롯한 폴리페놀 추출효율을 극대화하는 추출기법을 대량생산을 위한 가공생산공정 기술로의 전환이 필요하다. 가공 생산 공정은 세척→ 습식분쇄 → 효소 반응 → 압착 → 여과 → 충진 → 후살균의 흐름도를 가지며 각 공정 단계에 적정조건을 부여함으로써 가공생산공정 기술개발을 완료하여, 과실 가공산업의 활용범위 확대에 기여하고자 한다.

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국내 귀리 스낵처리에 따른 팽화귀리의 품질특성 변화

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전라북도농업기술원

귀리는 2002년 세계 10대 슈퍼푸드로 선정된 이후 소비자 관심과 수요가 점차 증가하여 국내 재배면적은 '19년 기준으로 '13년 대비 4.3배 증가하고 있고 단백질, 지방질, 불포화지방산(79~83%)이 풍부하고, 혈중 콜레스테롤 저하 및 항당뇨 효과가 있는 베타글루칸(2~6%)과 토코트리에놀, 그리고 다른 페놀화합물보다 최대 30배의 높은 항산화성을 보이는 폴리페놀류 화합물인 아베난쓰라마이드 등을 함유하고 있다.

시즈닝 첨가량에 따른 팽화 귀리의 품질특성 중 pH와 당도는 시즈닝 첨가량이 증가함에 따라 증가하는 경향을 보였고 색도의 명도(L)는 첨가량이 증가할수록 감소하였고 적색도(a)는 증가하였다. 시즈닝 첨가량에 따른 팽화귀리의 유효성분 함량 중 베타글루칸 함량과 아베난쓰라마이드 함량은 시즈닝 첨가량이 증가할수록 유의적으로 낮은 함량을 보였다. 시즈닝 첨가량에 따른 팽화귀리의 총 폴리페놀 함량, DPPH 라디컬 소거능 및 ABTS 라디컬 소거능은 시즈닝 첨가량이 증가할수록 유의적으로 증가하였다. 쌀 귀리의 총 폴리페놀 함량은 무처리 대비 19.3~32.5% 겉귀리는 16.0~20.0% 까지 증가하였다. 또한 시즈닝 팽화귀리의 관능 중 맛과 향은 첨가량이 증가함에 따라 증가하는 경향을 보였고 전반적인 기호도는 유의적인 차이를 보이지 않았다. 항산화능, 유효성분함량, 관능을 고려할 때 쌀귀리, 겉귀리 시즈닝은 팽화 귀리 무게 대비 10~20%가 적절한 것으로 판단됩니다.

P2-29

데침 조건과 가염 조건에 의한 울릉도산 섬쑥부쟁이, 큰미역취, 물엉겅퀴의 색도 변화

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나물류는 제한된 수확시기와 짧은 저장기간으로 인해 연중 지속적인 공급에 어려움이 많다. 이러한 한계를 극복하고자 상당수의 나물은 데친 후 건조된 형태의 건조나물로 판매가 이루어진다. 건조 전 나물을 데치는 경우가 많은데, 이것은 품질 저하의 원인이 되는 효소의 불활성화, 저장기간 중 색상의 변화 방지, 조직 연화의 최소화, 기호성과 기능성의 보존 때문이다. 특히 포장되어 시판되는 건조나물의 경우 제품의 색상이 소비자의 기호도와 제품 선정에 직접적인 영향을 미치므로 나물의 색상 보존이 경제적 측면에서 매우 중요하다. 본 연구에서는 울릉도 산나물인 섬쑥부쟁이, 큰미역취, 물엉겅퀴의 건조나물 제조 시 색상 유지를 위한 최적 전처리 조건을 탐색하였으며, 데침 시간 및 소금 첨가량에 따른 각 산나물의 색상 변화를 색도색차계를 이용하여 비교하였다. 섬쑥부쟁이, 큰미역취, 물엉겅퀴 모두 데침 처리 시간이 증가함에 따라 색상이 옅어지고, 갈변이 일어나며, 조직이 연화되는 현상이 관찰되었다. 산나물의 종류에 따라 소금 첨가량에 다소 차이는 있지만, 소금을 첨가하여 데칠 경우 전반적으로 산나물의 색상이 선명하게 잘 유지되었다. 그러나 소금 첨가량이 과도한 경우 산나물 외관 부분에 수축이 심하게 일어났다. 결과적으로 가염 조건을 달리하여 데친 섬쑥부쟁이, 큰미역취, 물엉겅퀴의 건조 후 색상을 비교한 결과, 소금 첨가량 약 3% 이내에서 녹색이 잘 유지됨을 확인할 수 있었다.

P2-30

A Comparative Analysis of Physiochemical Properties of Plant-based Alternative Meat with different Fat Content

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Plant-based alternative meat with full fat (FPAM) was prepared and compared with plant-based alternative meat with defatted (DPAM). Moisture contents, crude ash contents, crude fat contents, water binding capacity, TPA, microbiological analysis and acid values, peroxide value, and TBA of PMA were analyzed during storage for 20days. The moisture content of FPAM and DPAM was 48.63±0.67, 48.80±0.90, and the crude ash contents was 4.32±0.01, 5.08±0.03, and crude fat contents was 17.76±2.69, and 8.10±1.09. Color value

was no significant difference in the L value, and in the DPAM, the *a* value was higher, and the *b* value was lower. When the sample was stored at 5℃ for 20 days, there was no significant difference in water binding capacity and pH. In TPA, hardness, Chewiness, Gumminess, and cohesiveness all were increased as the storage period increased. Springiness and cohesiveness were decreased as the storage period increased. In the case of microbiological analysis, none were present. FPAM of acid value and peroxide value was increased while DFSM did not increase as the storage period increased. TBA of FPAM was higher than DFSM.

P2-31

Radical scavenging activity and quality characteristics of domestic malts made with oats

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This study was conducted to investigate the quality characteristics and antioxidant activity of malt made from oats. The moisture content of the oat malt was contained 7.33%. The pH, total sugar content, and soluble solid of the oat malt was at 6.05, 119.95 mg/g, and 2°Brix, respectively. The color values of the malt were 56.37 at the L(lightness) value, 2.27 at a(redness) value, and 18.08 at the b(yellowness) value. The protein contents of oat were contained 13.83%. Also, the oat malts higher increased to 14.95% than the barley. The diastatic power was showed at oat malt (163.39 W.K), and higher increased than other malts.The domestic oat malt showed the highest total polyphenol, flavonoid content, and tannic acid. In addition, in the DPPH and ABTS radical-scavenging activity of domestic oat malt extract was increased in a dose-dependent manner and it showed a higher content than other malts. The domestic oat malt contained a higher reducing power than ascorbic acid at 700~1000 ug/mL concentration. Therefore, these results suggest that domestic malts can be used effectively as functional foods with antioxidant activity or free radical scavenging activity.

P2-32

Quality characteristics comparison of domestic malt made with two-row barley and foreign malts

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This study was carried out quality characteristics and antioxidant activity in domestic and foreign malt. The protein contents of Hopum and Gwangmaeg barley were 13.83% and 10.57%, respectively. Also, the Hopum and Gwangmaeg malts higher increased to 14.95% and 11.65% than the barley, Denmark malt (9.78%) and German malt (11.8%). The kolbach index of the Hopum and the Gwangmaeg malts was at 17.18% and 16.39%. the diastatic power was showed at Hopum malt (163.39 W.K) and Gwangmaeg malt (157.79 W.K), and higher increased than Denmark and Germany malts. The Gwangmaeg malt of total flavonoid content (148.88 mg CHE/g) is higher than other malts. DPPH radical scavenging activity of Hopum malt was high activity at 500 μg/mL concentration. ABTS radical scavenging activity observed the Hopum malt (81.19%), Gwangmaeg malt (72.97%), and Damark malt (81.17%) at 1000 μg/mL concentration. The extracts of Hopum malt (81.19%) was highest activity in our groups. The ABTS and DPPH scavenging ability and reducing power activities increased significantly with increasing malts concentration ($p<0.05$) These results suggest that domestic malts can be used effectively as a functional food with anti-free radical scavenging activity.

P2-33

Platform for farmstead dairy processing and the quality characteristics of the dairy products

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One hundred and thirteen dairy farms produce yogurt and cheese, and utilize the dairy products for experience and sale(KFDA, '22.1). One of the most difficult things is short of advertisement for the farm and the products. We constructed 'farmstead dairy processing farm alimi(www.fmpc.or.kr)' for advertisement of dairy farms and products and establishing products quality management system. From now on forty three farms have been involved and

more farms will be added. We provide microbiological, chemical, and sensory characteristics of their products and the average of the product group to the farms involved for using in quality management. For this proceeding, we presented the microbial, chemical, and sensory quality change after 2 weeks cold storage of market milk(cow and goat milk), fermented milk(cow and goat milk), 8 kinds of cheese(string, gouda, kwark, haloumi, cottage, colby, and berg).

P2-34

영상처리기법을 이용한 불량누에고치 판별 분석 연구

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본 연구에서는 영상처리기법을 이용하여 불량 누에고치의 판별 가능성을 구명하고자 하였다. 누에고치 이미지는 DSLR(Digital Single-Lens Reflex) 카메라를 통해 정상 누에고치 92개, 불량 누에고치 207개를 획득하였고, 획득된 이미지는 카메라로부터 수직 높이가 약 30cm 떨어진 위치에서 할로겐램프에 밀접한 상태로 측정하였다. 누에고치를 제외한 배경은 이진화를 통해 제거하였고, 영상처리 속도 향상을 위해 8688×5792 해상도의 이미지를 고치를 중심으로 한 관심영역(Region of Interest, ROI)을 추출하여 1784×1328의 해상도로 크기를 조정하였다. 정상 및 불량 고치를 판별하기 위해 3가지 종류(RGB, Grayscale, Lab)의 색상 특징을 추출하였고, 추출된 특징을 각각 평균화하여 학습 데이터로 사용하였다. 평균화된 색상 특징값과 선형판별분석(Linear Discriminant Analysis, LDA) 및 이차판별분석(Quadratic Discriminant Analysis, QDA)을 이용하여 이미지 분류를 진행하였다. LDA 결과, RGB, Grayscale, Lab에서 각각 92.3%, 67.2%, 96%의 판별 정확도를 보였으며, QDA의 경우 각각 96.3%, 65.2%, 97.3%의 판별 정확도를 나타내었다. Grayscale을 제외한 RGB와 Lab 특징값에서 LDA보다 QDA 분류 성능이 높은 결과를 나타내었고, RGB보다 Lab 특징값을 이용한 분석 결과가 QDA 분류에서 97.3%로 가장 높은 정확도를 나타내었다. 할로겐램프에 밀접하여 획득한 누에고치 이미지는 영상처리 및 통계분석을 통하여 정상 및 불량 고치를 적절하게 분류할 수 있음을 보여주었다.

P2-35

울릉도 섬쑥부쟁이의 건조 방법에 따른 품질 특성 비교

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경상북도 울릉군의 지역특화 산채 중의 하나인 섬쑥부쟁이(*Aster glehni*)는 국화과 참취속에 속한 식물로 산지에서 자라는 여러해살이풀이며, 어린순과 잎은 데쳐서 나물로 애용하며, 묵나물로 저장하는 것이 보편적인 방법으로 알려져 있다. 최근 고령 사회에 진입됨에 따라 항균, 항산화, 항염 및 면역강화 등 생리활성을 갖는 약용작물이나 산채류에 대한 평가가 높아짐에 수요가 증가하는 추세이다. 본 연구에서는 섬쑥부쟁이 나물의 고령친화 식품 소재화를 위하여 생채를 채취하여 데침 과정(수용성 발효칼슘 B)을 거치고 열풍건조(HD), 동결건조(FD)와 습식 분쇄하여 분무건조(SD) 각각의 건조방법 및 조건에 따른 품질을 비교하였다. 그 결과 섬쑥부쟁이의 건조방법 따른 수분함량은 HD 4.8%, FD 6.0%, SD 5.4%를 나타냈었다. 색도 변화는 a값은 FD가 -8.13으로 짙은 녹색을 나타냈으며, b값은 SD가 25.70으로 황색을 띄었다. 또한 다양한 식품소재로 활용하고자 분말을 열수에 각각 침출한 결과 추출물의 pH 값은 pH 6.22~6.24 범위로 건조 방법에 따른 차이는 크게 나타나지 않았다. 색도변화는 L 값이 열풍건조추출물(HDE)는 8.66으로 가장 낮은 값은 나타냈다. a값은 HDE가 가장 낮은 값으로 나타냈으며, 동결건조추출물(FDE) 및 분무건조추출물(SDE)는 녹색을 나타내었다. b값은 SDE가 가장 높은 값으로 황색을 나타내었다. 항산화활성을 나타내는 총 폴리페놀 함량은, HDE 20.34 mg/mL, FDE 18.75 mg/mL, SDE 23.51 mg/mL를 나타냈었다. 추출물의 농도별(100, 500, 1,000 및 10,000 ppm) DPPH 및 ABTs radical 소거 활성 조사결과, 농도의존적으로 증가하는 경향을 보였으며, SDE가 가장 높은 소거활성을 나타내었다. 이상의 결과에서 섬쑥부쟁이의 식품소재로 활용하는 방법으로는 분무건조 소재화 방법이 우수한 것으로 나타났으며 향후 유효성분 함량 등에 관한 연구를 진행하고자 한다.

P2-36

RGB 영상 정보 분석을 통한 바나나의 숙도 및 저온 장해 예측

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바나나는 저온 장해 발생 온도가 상대적으로 높은 아열대작물로 수확 후 저온에 노출될 시 비정상적으로 후숙되므로 유통 및 이용 전 단계에서 바나나의 저온 노출 여부를 판단하는 것이 중요하다. 본 연구에서는 CCD(charge coupled device) camera로 촬영한 바나나 외관 이미지 정보를 분석하여 숙도(미숙, 적숙, 과숙)와 저온장해 유무를 예측하고자

하였다. 수확 후 저온(10℃)에서 0시간 또는 24시간 저장 후 20℃에서 후숙한 바나나의 경우 저온 장해 특성이 발견되지 않았다. 반면 10℃에서 72시간 이상 보관된 바나나의 경우 저온 장해 특성이 발견되었으며, 저온에 노출된 시간이 길수록 저온 장해 강도가 높아졌다. CCD camera로 촬영한 바나나 외관 이미지의 각 픽셀을 12bit-RGB 데이터로 추출하여 분석한 결과, 미숙과 적숙 단계에서는 정상과와 저온장해과를 구별하는 것이 가능하였다. 숙도와 저온 장해 유무를 판단하기 위해 필요한 색상코드는 총 237개였으며, 이 색상코드를 사용하여 부분 최소 자승 회귀 분석을 시행한 결과 R^2이 0.82로 높게 나타나 숙도와 저온장해 유무에 따라 분류가 가능한 것으로 나타났다. 각 그룹의 예측 정확도를 살펴본 결과, 정상과와 저온장해과의 예측 정확도는 미숙 단계에서 각각 71%와 75%로 나타났으며, 적숙 단계에서 각각 85%와 87%로 높게 나타났다. 따라서 바나나의 선별 또는 유통단계에서 RGB 데이터 취득을 통해 숙도 상태와 저온 장해 발생 유무를 판단할 수 있을 것으로 판단된다.

P2-37

Physicochemical characteristic and sensory evaluation of kimchi containing heat-treated garlic

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Recently, Kimchi has been recognized worldwide for many years. However, the off-flavor of Kimchi is a big problem for foreigners, and it is necessary to develop a recipe that can reduce off-flavor. Among the ingredients of Kimchi, the degree of off-flavor is determined by garlic and salted seafood. Therefore, the purpose of this study was to develop a method for making Kimchi without off-flavor. Kimchi was prepared with raw-garlic (RG), heated-garlic (HG), frozen-garlic (FG), respectively, and soy sauce was used as a substitute for salted fish. Fermentation carried out for 12 days, the pH and acidity of Kimchi were 4.41~4.47 and 0.76~0.79%, respectively, and there was no significant changes in all Kimchi except FGK. In the sensory evaluation, the overall acceptability was evaluated in the order of HGK> RGK> FGK, the off-flavor was the lowest in HGK. The main volatile components of garlic are diallyl_sulfide, diallyl_disulphide, diallyl_trisulfide, methyl_disulfide and allyl methyl sulfide, which were hardly detected in Kimchi without garlic (NGK) and Kimchi with heated garlic (HGK). According to these results, the use of HG has been shown to help reduce off-flavor of Kimchi

P2-38

Manufacturing and sensory evaluation of whole wheat added kimchi

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Wheat grown in Korea has been favored by consumers as an eco-friendly agricultural product. The usage of whole wheat, which is rich in dietary fiber, vitamins and minerals, has also increased. This study was conducted to supplement the taste of vegan kimchi by adding whole wheat instead of glutinous rice paste. For kimchi without glutinous rice paste, a total of 4 groups were prepared: a control group (Con), a group with glutinous rice paste (GRP), a group with whole wheat flour (WWP), and a group with whole wheat rice (WWR), respectively. WWR showed the highest sugar content during the aging period, while no significant change was observed in pH value during storage step. On the other hand, the color-difference comparison were carried out using CIE L*, a*, b* values. The L*, a*, b* values indicating degree of brightness (L*) and redness (a* and b*), respectively, showed that GRP was brightest and most redish among the treatment groups even after 12 days of storage. There was no significant difference in the number of lactic acid bacteria among the treatment groups. As a result of comparing the difference in gas composition during storage, it was observed that oxygen and carbon dioxide concentrations were relatively low when kimchi was prepared with WWP and WWR. As a result of the sensory evaluation, when stored at 10 ℃ for 12 days, the odor preference was evaluated high in WWP and WWR, and the sour taste was evaluated low. Taste preference and overall preference were also highly evaluated for WWP and WWR. The results of this study demonstrated the possibility of using whole wheat as a substitute for glutinous rice paste.

P2-39

Effect of silkworm powder on viscoelastic and structural properties of corn starch based 3D food printing ink

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In this study, the printability of different silkworm powder-corn starch blends was assessed. The effects of silkworm powder at 78 μm, 125 μm, and 190 μm on the structural properties of the three-dimensional products were examined, and the printing characteristics and accuracy of the samples were assessed along with printing stability. A viscoelastic analysis of the 3D-printing blends was carried out, considering their behavior during extrusion (dependent on viscosity and thixotropy) and self-recovery after printing (dependent on viscosity-recovery, thixotropy, and storage modulus: G'). Also, a microstructural characterization was performed through cryofracture in SEM. The results showed that the 3D printed inks with 5% mass fraction of powder size 125 μm had the highest precision and the best masticatory properties. Also, international dysphagia diet standardization initiative (IDDSI) tests indiciated that 78 μm containing ink failed the spoon tilt test within IDDSI framework, while 125 μm and 190 μm containing inks could be classified as level 5-minced and moist dysphagia diet. In addition to provide theoretical guidance, process references and technical support to actually produce silkworm 3D printing materials, this study provides practical implications for the development of 3D food printing inks.

P2-40

조미 소재 활용을 위한 마늘 페이스트 제조 및 품질특성

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마늘(*Allium sativum* L.)은 백합과(*Lilliaceae*)의 파속(*Allium*)에 속하는 양념용 채소로서 옛날부터 향신료와 조미식품으로 널리 이용되어 왔으며, 건강기능식품의 고시형 기능성 원료로 식품의약품안전처에 등록되어 활용되고 있다. 그러나 일반 식품으로 소비되는 마늘은 깐 또는 다진 마늘의 형태로만 반가공.판매되고 있어, 소재 다양화를 위하여 마늘 페이스트를 제조하고 마늘의 독특한 맛과 향이 요구되는 소스 및 양념 등에 조미 소재로 활용하고자 하였다. 마늘 페이스트는 품종(남도, 대서)과 가공 처리(생, 데침, 삶음, 증자)를 달리하여 제조하고 품질 및 관능특성을 조사하였다. 당도는 가공 처리별 생 > 증자 > 데침 > 삶음, 품종별 남도 > 대서 순으로 높게 나타났고, 황색도는 가공 처리별 생 > 데침 > 증자 > 삶음, 품종별 남도 > 대서 순으로 나타났다. 알리인의 함량은 증자 처리한 남도 마늘에서 874.9 ㎎/100 g으로 가장 높았으며, 알리신의 함량은 대서 생마늘에서 41.5 ㎎/100 g으로 가장 높았고, 대서 생 > 대서 데침> 남도 생 > 남도 데침 > 남도 삶음 > 대서 삶음 > 남도 증자 = 대서 증자 순이었다. 관능평가 결과 대서 품종 데침 처리 시 마늘 향과 감칠맛 등의 기호도가 높아 조미 소재로 활용 가능성을 시사하였다.

P2-41

Comparative physiochemical characteristics between *Kimchi* and *Mukeunji* collected from the southern regions of korea

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In order to identify of the physicochemical characteristics of Korean traditional fermented foods, *Kimchi* and *Mukeunji,* and to compare the physicochemical characteristics between *Kimchi* and *Mukeunji*, we performed physicochemical characteristics analysis. For analysis, 30 samples of *Kimchi* and *Mukeunji* were randomly collected from the southern regions (Gwangju·Jeolla, Busan·Gyeongsang, and Jeju) of Korea, and analyzed for pH, acidity, salinity, and sugar content. As a result of pH and acidity measurement, the average pH and acidity of the *Kimchi* group were pH 5.50 ± 0.43 and 0.40 ± 0.11%, respectively, and the average pH and acidity of the Mukeunji group were pH 3.82 ± 0.23 and 1.44 ± 0.29%, respectively. These results showed that pH was decreased and the acidity was increased gradually by the influence of

microorganisms involved in the fermentation process of *Kimchi.* In addition, the average salinity of the *Kimchi* group was 3.02 ± 0.52%, and the average salinity of the *Mukeunji* group was 3.03 ± 0.59%. Also, the average sugar content was 11.76 ± 1.36 brix° in the *Kimchi* group and 9.29 ± 1.55 brix° in the Mukeunji group. There was no significant difference in salinity, but it was confirmed that there was a difference in sugar content. The results of this study will be usefully utilized in the quality standardization and quality development of traditional fermented foods such as *Kimchi* and *Mukeunji.* (This work was supported by a grant from the Establishment of Integrated Biobank for Agriculture, Food and Livestock Microbiome Project funded by the Ministry of Agriculture, Food and Rural Affairs (MAFRA))

P2-42

갓 가공품 개발을 위한 데침 처리별 품질특성

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갓(*Brassica juncea*)은 십자화과에 속하는 경엽 채소류로 줄기와 잎은 주로 김치로 식용되고 씨는 향신료로 사용되고 있다. 국내의 갓 주산지는 전라남도 여수로 연간 3~4회 수확되고 있으나, 원물은 수확 후 저장기간이 2~3일로 매우 짧고 가공품은 갓김치 이외의 제품이 거의 없는 실정이다. 이에 따라 장기 저장 및 유통이 가능한 갓 가공품 개발이 요구되어 영양.기능 성분이 우수한 데침 갓을 제조하여 가공품의 원료로 활용하고자 하였다. 데침 갓은 100℃ 끓는물에서 열처리 시간(1, 3, 5, 10, 15, 20min)과 염처리 농도(0.5, 1.0, 1.5, 2.0%)를 달리하여 제조하고 품질특성 및 관능특성을 조사하였다. 녹색도는 열처리 3분 및 염처리 0.5%에서 가장 높았으며, 루테인 함량은 3분 열처리 시 2.6 mg/100 g으로 가장 높게 나타났다. ABTS법을 이용한 항산화 활성은 처리간 유의적 차이가 나타나지 않았으며, 관능평가 결과 염처리 없이 열처리 3분 처리구가 색, 조직감 및 전체적인 기호도가 높게 나타나 갓 가공품 원료로 활용 가능성을 시사하였다.

P2-43

고려엉겅퀴 우수품종 육성을 위한 집단별 특성조사 및 관능평가 연구

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본 연구는 곤드레나물로 잘 알려진 고려엉겅퀴의 표준품종 개발을 위하여 우수집단을 선발하고자 하였다. '20년도 영월 등 4지역에서 고려엉겅퀴 종자를 수집하였으며 3년에 걸쳐 집단 선발 및 우량 개체를 육성하고 있다. 선발 형질은 다수확, 광엽에 가시적은 우수 개체이며 집단별 생육조사, 수량성 조사, 데침 후의 관능평가를 진행하였다. '21년 조사 결과 20수CS01이 다른 집단에 비해 초장이 긴 편이며 분지수 및 주당 광엽매수가 많았다. 수확은 3차에 걸쳐 진행하였고 20수CS04가 2,783kg/10a로 가장 많았다. 고려엉겅퀴를 데친 후 경도 및 색도를 조사하였고 관능평가 결과 20수CS01이 다른집단에 비해 색, 식감이 연하고 가장 선호도가 높게 나타났다. 선호도가 좋게 나타난 20수CS01, 수확량이 많게 조사되었던 20수CS04를 선발하여 '22년 수확량 조사 및 특성조사를 추가로 진행하였다. '21년 조생, 만생으로 나누어 집단 선발후 채종한 종자를 이용하였으며 트레이 파종 후 5/17일 본포에 정식하였다. 1차 수확량 및 특성조사를 진행한 결과 초장 및 분지수가 20수CS01(조생)cy2가 높았고 SPAD값, 수확량도 가장 높게 나타났다. 선호도조사 결과 작년과 마찬가지로 20수CS01 집단이 높게 나타났다. 본 시험의 결과를 토대로 차년도 집단선발 대상 선정 및 품질이 우수하고 균일한 고려엉겅퀴를 선발해가고자 한다.

P2-44

Evaluation of quality characteristics of kimchi seasoning products

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Recently, the concept of a smart factory has also been introduced into the kimchi industry with the spread of automation devices that put seasoning in salted Kimchi cabbage. The priority to consider for the establishment of an automation system for the kimchi seasoning manufacturing process is the selection of quality indicators necessary for process management. This study was conducted to derive quality indicators of the kimchi seasoning manufacturing process by evaluating the physical and microbiological quality characteristics of 20 kinds of kimchi seasonings. All of the kimchi seasonings had a pH of 5 or higher, and acidity of 0.16 to 0.87 in various ranges. As a result of analyzing the correlation between the quality characteristics of kimchi

seasoning, there was a positive correlation between L value and b value, a positive correlation between viscosity and soluble solids content, and a negative correlation between viscosity and moisture. In particular, soluble solids content showed a strong negative correlation with moisture content (r=-0.96), and if the results of the analysis of soluble solids and moisture content are expressed in a regression equation, it is derived from y (moisture content) = -1.2329x (soluble solids content) + 96.439, and it is believed that the moisture content of the seasoning can be estimated from the soluble solids content. As a result of the main ingredient analysis of the quality characteristics of kimchi seasoning, the variable that has the greatest effect on PC1 is soluble solids, and soluble solids content is correlated with salinity and viscosity. In conclusion, it is thought that color, viscosity, salinity and soluble solids content can be used as quality indicators in the seasoning manufacturing automation process.

P2-45

냉동저장 온도 및 기간에 따른 데친 유채의 품질특성 변화

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나물은 수분함량이 높아 유통기한이 짧고, 수확시기가 한정되어 주로 건나물 형태로 소비되고 있다. 그러나 건나물은 조리할 때 복원하는 시간이 많이 필요하다. 따라서 본 연구에서는 장기저장이 가능한 고품질 유채 나물을 제조하기 위해 수행하였다.

유채를 데친 후 냉동하여 3개월간 -20~-5℃에서 저장하면서 저장 온도 및 기간에 따른 이화학특성 및 관능적 특성을 조사하였다. 그 결과 냉동나물 침출액은 상대적으로 낮은 온도에 저장할수록 적었으며, -5℃에 저장했을 때는 저장 기간이 길어질수록 증가하였다. 그러나 -15℃와 -20℃에서는 저장 1개월 미만에서 증가하였지만, 그 이후에는 유의적인 차이가 없었다. 수분함량은 모든 처리온도에서 저장 기간이 길어질수록 감소하는 경향을 보였으나 저장 온도가 낮을수록 감소율이 낮았다. 경도는 저장 온도 및 기간의 변화에 따른 유의적인 차이를 보이지 않았다. 일반세균수는 저장 2개월까지 모든 처리구에서 10^2~10^3 CFU/g의 범위를 보였으나 -5℃에서 3개월 저장했을 때는 10^5 CFU/g으로 급증하였다. 관능적 특성은 -5℃에서 1개월 이상 저장한 경우 나물 본연의 색을 잃었다. 또한, 약간의 이취가 나면서 조직이 물러지거나 수분이 침출되어 질겨짐에 따라 모든 항목에서 4점 이하로 점수가 낮았다. 결론적으로 데친 유채는 -15℃ 이하에서 저장하였을 때 품질이 우수하였고, 3개월 이상 저장할 수 있을 것으로 생각되었다.

P2-46

김치유산균 이용 갈색거저리 유충 분말 첨가 쌀 요구르트 특성

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본 연구에서는 지속적으로 감소하고 있는 쌀 소비 촉진 및 갈색거저리 소비시장 확대를 위해 GABA 생성능이 우수한 *Levilactobacillus brevis* B737을 종균으로 사용한 갈색거저리 유충 분말 첨가 쌀 요구르트를 제조하여 발효 중 쌀 요구르트의 특성과 GABA 함량 및 아미노산 조성 변화를 확인하였다. 경남 통영 시장에서 구입한 배추김치에서 분리한 L. brevis B737은 박층 크로마토그래피(TLC)에서 MSG 3% 농도에서 24시간 만에 GABA로 빠르게 변환되는 것이 확인되었고, GABA 함량을 정량한 결과 84.07 mg/100mL 를 나타내었다. 쌀 요구르트 제조를 위한 쌀과 갈색거저리의 최적 고형분 함량은 쌀가루 8%, 갈색거저리 분말 5%로 확인되었으며 포도당을 3%(w/v) 첨가하였을 때, 쌀 요구르트의 pH 감소와 적정산도의 값은 더욱 증가하여 *L. brevis* B737의 성장이 촉진되었음을 확인하였다. 또한 쌀 요구르트의 최적 발효시간은(쌀가루 8%, 갈색거저리 분말 5%, 포도당 3% 포함)은 24시간으로 확인되었다. 발효된 쌀 요구르트를 4℃에서 3일간 보관하면서 냉장 저장 중 안정성을 측정한 결과, 색도는 큰 변화가 없었으며 pH와 당도 및 점도가 약간 감소하였지만 외관 변화나 감각 평가에서 유의미한 차이가 없어 쌀 요구르트는 냉장 보관 시 품질 변화를 일으키지 않는 것으로 나타났다. 쌀 요구르트의 발효 전, 발효 후 GABA 함량은 각각 1.09 mg/100mL, 7.09 mg/100mL 를 나타내어 발효 후 GABA 함량은 증가하였고, glutamic acid와 tyrosine 함량은 감소하였다. 이상 결과들에서 L. brevis B737을 종균으로 사용한 갈색거저리 유충 분말 첨가 쌀 요구르트가 새로운 발효식품으로 생산될 수 있다는 가능성을 보여주었고, 쌀 요구르트의 감각적 특성 및 외관 개선 추가 연구를 통해 쌀과 갈색거저리 소비 촉진에 기여할 수 있을 것으로 보인다.

P2-47

Development of a manufacturing method for *Cudrania tricuspidata* tea with increased antioxidant activity

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Our research was to develop Cudrania tricuspidata Tea with an increased extraction amount of antioxidants contained in Cudrania tricuspidata.

The test treatment of Cudrania tricuspidata was processed by freeze-drying (A), hot-air drying (B), and hot-air drying after blending (C), which are used for general tea production.

In addition, the treatment method to increase the antioxidant activity of

Cudrania tricuspidata Tea is as follows. Cudrania tricuspidata fresh fruit was soaked in 80% Et-OH (D) and hot water (E) to make an extract, Cudrania tricuspidata soaked in the extract was dried with hot air. The extract was coated on the dried Cudrania tricuspidata.

The results of comparing the polyphenol content to measure the antioxidant activity of Cudrania tricuspidata Tea are as follows. The content of the hot water extract coating treatment was the highest, followed by the alcohol extract coaching treatment. Freeze-drying and hot-air drying treatment were irradiated with similar low values, and the hot-air drying treatment after blending was investigated the lowest.

The results of the Color values survey in Cudrania tricuspidata Tea are as follows. The extract coating treated group had the lowest brightness (L) value, and the yellowness level (b) was high. Redness (a) did not show a significant difference between the treatment sections.

In conclusion, extract coating treatment for the production of Cudrania tricuspidata Tea was considered as a method to increase antioxidant activity. In the future, we plan to conduct research on supplementing taste and improving product productivity.

P2-48

해동방법을 달리한 냉동 데친 유채의 품질특성 변화

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냉동식품은 해동하는 방법에 따라 제품표면 및 심부의 온도 변화, 해동시간 등에 차이가 발생하며 최종적으로는 제품의 품질에 영향을 주게 된다. 본 연구에서는 냉동 데친 유채를 해동할 때 가장 품질 변화가 적은 해동방법을 선정하기 위하여 서로 다른 방법(수돗물, 마이크로웨이브, 냉장, 상온(25℃))으로 해동한 데친 유채의 이화학 및 관능적인 특성을 조사하였다. 색도, 엽록소 함량은 해동 방법에 따른 경향성이 없었으며 침출액은 수돗물을 이용하는 것이 가장 적었다. 미세구조 관찰결과 수돗물로 해동했을 때보다 마이크로웨이브, 상온, 냉장 해동은 상대적으로 조직에서 관찰되는 세포의 크기와 두께가 균일하지 않았으며 특히 마이크로웨이브를 이용하여 해동했을 때 조직의 표면에 상대적으로 많은 열이 가해지면서 세포구조가 가장 많이 손상된 것으로 확인됐다. 관능평가는 외관, 색, 조직감, 맛, 향, 전체적인 기호도로 구분하여 실시하였다. 외관과 색에서는 색도, 엽록소 함량의 결과와 비슷하게 큰 차이가 발생하지 않았으며 조직감, 전체적인 기호도는 수돗물을 이용하는 것이 가장 높은 것으로 확인되었다. 결론적으로 냉동 데친 유채는 수돗물을 이용하여

해동하는 것이 품질 변화를 최소화하고 소비자들이 높은 기호도를 보일 수 있는 방법으로 생각된다.

P2-49

발효위치에 따른 전통된장 발효 전·후 품질특성 및 미생물군집 비교

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기후는 지역별, 년차별로 그 양상이 다소 차이를 보이고 있어 전통장류의 품질과 미생물 분포에 영향을 미친다. 따라서 본 연구에서는 전남지역 내 전통된장을 노지(JDF, JSF)와 스마트시설(JDS, JSS), 강원도 노지(JDPF, JSPF)에서 발효하면서 발효 전·후 품질특성 및 미생물 군집이 어떻게 변화하는지 조사하였다. 전통된장의 평균 최고 품온은 JS 지역(23.9℃) > JD 지역(21.9℃) > PF 지역(17.4℃), 스마트(23.2℃) > 노지(22.6℃) > 강원도노지(17.4℃)이었다. 최고, 최저 품온이 가장 낮았던 강원도 노지에서 발효한 JDPF, JSPF는 발효 후 명도(L*)와 a-amylase 활성은 높았고, 아미노태질소 증가량은 가장 낮았다. 특히, a-amylase 활성은 강원도 노지에서 가장 높았는데 결과적으로 이소플라본 비배당체(aglycon) 함량과 Glucose 함량은 가장 낮았다. 미생물군집의 경우, 세균은 JD 지역은 *Enterococcus hirae,* JS 지역은 *Bacillus velezensis*이 우점하였으며, 특히 최저, 최고 품온이 낮은 강원도노지에서 *Bacillus velezensis* 점유율이 높았고, 온도가 더 높은 지역에서 발효 후 *Bacillus piscis, Bacillus velezensis*균이 증가하였다. 또한 진균은 JD, JS 지역 모두 *Wickerhamiella versatilis, Aspergillus_amstelodami*균이 우점하였으며, 특히, 강원도노지에는 *Zygosaccharomyces rouxii* 점유율이 높았다.

P2-50

진도 강황 추출조건에 따른 커큐민 함량 및 수율 비교

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강황(*Curcuma longa.* L.)은 항균, 항염증 및 항암 등 다양한 기능성이 있는 것으로 보고되고 있으며 전남 진도에서 전국 생산량의 60%를 재배하고 있는 주요 지역특화작목이다. 강황을 건강기능성 소재로 사용할 수 있는 기초자료 확보를 위해 강황의 주요 기능성 물질인 커큐민 최적 추출조건을 검토하였다. 강황 커큐민류(Bisdemethoxycurcumin, Demethoxycurcumin, Curcumin)의 효율적인 추출을 위하여 먼저 50℃에서 EtOH 30%, 50%, 70% 농도조건으로 추출 함량 및 수율을 검토하였다. EtOH 30%, 50%, 70% 농도에

서 추출하였을 때 원재료 대비 추출물의 총커큐민 추출수율은 각각 8.3%, 34%, 47%로 농도 의존적으로 추출 수율이 높아졌으나 대량생산을 고려하였을 때 50% 농도가 적합할 것으로 판단되었다. 50% 주정 추출 공정 확립을 위해 추출온도, 추출시간, EtOH 배수에 따른 총커큐민 함량 및 회수율을 검토하였다. 추출온도가 높고 추출시간이 길어질수록 분말 수율 및 커큐민류 함량이 높아지는 경향이었다. 또한 EtOH 10배, 20배, 30배로 60℃에서 3시간 추출시 총커큐민 함량은 각각 1,992 mg/100 g, 1,780 mg/100 g, 1,679 mg/100 g로 10배 추출에서 가장 높은 경향을 나타내었다. 이러한 결과를 종합하여 볼 때 강황의 커큐민 추출조건은 50%의 EtOH 10배수를 첨가하여 60℃에서 3시간 추출하는 것이 가장 적합할 것으로 판단되어진다.

P2-51

강황 소재 첨가량에 따른 강황 발효유 품질 및 관능적 특성

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강황(*Curcuma longa.* L.) 소비확대를 위하여 일상적으로 섭취가능한 강황 발효유를 강황 분말과 강황 주정추출 분말을 0.1~0.3% 농도로 첨가하여 그 품질 및 제품화 가능성을 검토하였다. 강황 분말을 첨가한 발효유의 산도는 0.75~0.78 였으며 강황 주정추출 분말 첨가구의 경우 0.79 ~ 0.81로 더 높은 산도를 나타내었다. 첨가량에 따른 관능평가를 실시한 결과 강황 분말 및 주정추출 분말 모두 0.2% 첨가구에서 선호도가 가장 높게 나타났다. 또한 커큐민 함량 분석결과 분말 처리구는 0.4 ~1.0 mg/100 g, 주정추출 분말 처리구는 0.7 ~ 2.0 mg/100 g로 주정추출 분말 처리구에서 총커큐민 함량이 2배 정도 높은 것으로 분석되었다. 강황 첨가에 의해 발생하는 쓴맛을 개선하기 위해 당 첨가량을 사과즙 0.5%, 1%, 1.5%로 대체하여 발효유를 제조하다. 사과즙 첨가량에 따른 강황 분말 첨가 발효유의 산도는 0.62 ~ 0.66, 강황 주정추출 분말은 0.73 ~ 0.82로 대조구 산도 0.63보다 사과즙 첨가구가 더 높은 산도를 나타내었다. 최종 발효유의 당도를 분석한 결과 당 대체에 따라 당도에는 크게 영향을 미치지 않는 것으로 분석되었다. 강황 발효유의 관능평가 결과 분말 첨가보다 주정추출 분말 첨가구의 쓴맛이 더 높았으며 사과 첨가량은 분말 첨가구는 0.5%, 주정추출 분말 첨가구는 1% 첨가구에서 선호도가 높은 것으로 조사되었다. 제품생산을 위한 분산성 및 여과성을 검토하였을 때 분말처리구의 경우 분산에 어려움이 있고 필터에 여과되는 문제점이 있어 강황 추출분말을 이용하는 것이 적합할 것으로 판단된다.

P2-52

여주 쓴맛 개선을 위한 전처리 및 유산균 발효조건

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여주(쓴오이, *Momordica charantia* L)는 박과에 속하는 일년생 덩굴성 식물로 중국, 말레이시아, 인도 등에서 주로 재배되는 열대-아열대성 작물로 항균, 항바이러스, 항암, 항당뇨 및 항당뇨 효과가 높은 것으로 알려져 국내에서도 소비자 수요가 증가하고 있다. 하지만 특유의 쓴맛으로 인해 가공품 개발에 어려움이 있어 유산균 발효로 쓴맛을 저감하고 기능성을 높여 기능성식품 소재로 사용하고자 하였다. 유산균 3종에 대한 발효 중 관능평가와 기능성성분 함량을 검토한 결과 *Lactobacillus reuteri*로 발효하였을 때 다른 유산균보다 GABA 함량이 높고 풍미와 쓴맛 완화가 우수하여 여주 발효에 적합한 것으로 판단되었다. 여주 쓴맛 개선 효과를 증대시키고자 전처리(소금물, 소금+설탕, 식초, 증자)를 검토하였으며 그 결과 소금물 및 식초처리가 GABA 함량 및 항산화 효능 증진효과가 있었으나 식초처리의 경우 색변화 및 관능저하에 의해 소금물 처리구에서 높은 관능평가 결과를 나타내었다. 이러한 결과를 종합하였을 때 여주 쓴맛 개선 및 기능성 향상을 위한 발효조건은 소금물 수침으로 전처리 후 *Lactobacillus reuteri*로 3일간 발효하였을 때 대조구 대비 쓴맛이 현저히 저하되며 GABA 함량 또한 20% 이상 향상되는 효과가 있었다.

P2-53

강원 더덕의 식품학적 성분· 향기성분 및 가공적성 탐색

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본 연구는 강원도 지역별 더덕을 수집 후 일반성분, 향기성분, 가공 품질을 조사하였다. 더덕은 10월에 지역별, 고도별로 달리 수확한 더덕을 사용하였으며 홍천, 횡성은 3년근 더덕, 정선은 5년근 더덕을 시료로 하였다. 더덕의 외피와 속의 색도 및 깐더덕의 경도를 측정하였는데 색도는 정선더덕이 다른 더덕에 비해 더덕속의 L값, a값, b값이 높았고 경도는 정선더덕이 가장 작게 나타났다. 분말 제조시 원물 대비 홍천더덕은 21.5%, 횡성더덕은 19.8%, 정선더덕은 21.2%로 감소하였고 정선 더덕은 다공질에 거친분말 형태를 보였다. 일반성분 분석 결과 수분함량은 횡성더덕이 79.43%, 조섬유는 홍천더덕이 2.27g/100g으로 다른 더덕에 비해 높게 나타났다. 정선더덕의 TDF(총식이섬유)는 5.46g/100g으로 IDF(불용성식이섬유)가 약 73%에 해당 되었고 횡성과 홍천 더덕은 TDF 중 SDF(수용성식이섬유)가 약 51%로 나타났다. 더덕의 휘발성 향기성분은 GC-TOF/MS로 분석하였으며 수집한 지역별 더덕이 각기 다른 향기패턴을 보였고 1-Tridecyne, Silane, chlorodimethyloctadecyl-이 횡성더덕에서 가장 높았다. 관능검사를 통해 3가지

더덕을 비교해 보았으며 더덕향과 아린쓴맛은 정선더덕이, 단맛은 홍천더덕이 가장 강하다는 평가를 받았다. 선호도 조사에서 더덕향은 5년근 정선더덕이 높았고 색, 단맛, 아린맛, 식감 등 전체적으로 홍천더덕을 선호하는 결과를 보였다.

P2-54

홍화순 수확시기별 기능성성분 함량 및 홍화순 침출차 품질특성

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홍화(Safflower, *Carthamus tincotorious* L.)는 국화과에 속하는 일년생 초목으로 잇꽃, 잇나물이라고도 불린다. 민간 및 한방에서 골절 및 골다공증 등 골질환 치료제로 널리 사용되는 홍화씨 재배과정 중 부산물로 얻어지는 홍화순은 무기질이 풍부하고 식감이 우수하나 현재 식소재로 많은 이용이 되지 않아 수확시기별 기능성성분 검토를 통해 시기별 이용가능성을 확인하고 침출차를 제조하여 그 품질특성을 분석하였다. 3월 초부터 10일 간격으로 총 4회 수확하여 시기별 quercetin 함량을 분석한 결과 539 mg/100 g, 470 mg/100 g, 370 mg/100 g, 568 mg/100 g 으로 생육이 진행될수록 quercetin 함량이 유의적으로 낮아졌다가 꽃이 개화되는 시기에는 높아지는 경향을 보였다. 총페놀성화합물 함량은 1차 수확시기 677 mg/100 g에서 4차 수확시기 1037 mg/100 g, 항산화물질 함량(ABTS) 또한 1차와 4차 수확시기에 각각 13.1 mg/g, 25.5 mg/g 으로 4차 수확시기에서 높은 값을 나타내었다. 홍화순 이용확대를 위해 침출차를 제조하여 기능성성분을 분석한 결과 quercetin 1157 mg/100 g, kaempferol 11.4 mg/100 g로 홍화순에 비해 침출차 제조과정 중 플라보노이드 함량이 높아졌다. 홍화순 침출차는 온수 뿐만 아니라 냉수에서도 쉽게 차 성분이 용출되는 특징을 보여 년중 소비할 수 있는 제품개발이 가능할 것으로 사료된다.

P2-55

수분 및 갈변 감소조건별 양파 열풍건조분말의 이화학적특성 비교

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양파(*Allium cepa* L.)는 주요한 양념채소류로 많이 사용되나 조리 시 불편함과 쓰레기 발생으로 양파가루나 조미료 제품에 대한 소비자들의 선호가 높아지고 있다. 하지만 양파는 높은 당 함량과 수분으로 가공 시 케이킹 현상 및 갈변의 문제점이 있어 시판 분말제품 대부분 동결건조한 제품이지만 생산단가가 높은 문제가 있다. 따라서, 본 연구에서는 양파 분말제품의 생산 단가를 낮추기 위해 열풍건조 시 분말의 수분 및 갈변을 감소하는 전처리조건별 이화학적 특성을 조사하였고 이때, 건조는 50℃에서 24시간 열풍으로 하였

다. 양파 건조 전처리로 부형제 처리 4가지, 물리적 처리 5가지를 검토한 결과, 부형제 처리가 물리적 처리 대비 수율이 높고, 수분함량을 15% 이하로 감소시킬 수 있었다. 특히, 부형제 중 옥수수전분 처리구는 대조구 대비 갈변억제율이 42.2%로 가장 높았으며, 최종적으로 시금치나물로 관능평가 한 결과 양파 특유의 매운맛이 강한 동결건조분말 보다 전반적인 기호도도 가장 높았다. 이러한 옥수수전분 처리는 3% 농도에서 5분 동안 침지하는 것이 대조구 대비 수분함량을 45% 감소시키고, 갈변억제율 및 총 색차가 가장 높은 값을 보였다. 따라서 3% 옥수수전분 용액에 5분 동안 양파 슬라이스를 침지한 후 열풍건조 시 열풍건조의 문제점을 해결하는데 가장 적합할 것으로 판단되었다.

P2-56

양파 건조분말 종류별 품질 및 흡습특성 비교

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양파(*Allium cepa* L.)는 주요한 양념채소류로 원물뿐 아니라 분말제품으로도 많이 이용되고 있다. 그러나 분말제품은 양파의 높은 당 함량과 수분으로 가공 시 케이킹 현상 및 갈변의 문제점이 있어 시판 분말제품 대부분 동결건조한 제품이지만 생산단가가 높은 문제가 있다. 따라서, 본 연구에서는 동결건조(FD)과 열풍건조(HD), 수분 및 갈변을 감소시킨 열풍건조(SHD) 분말의 품질 및 흡습특성을 비교하여 열풍건조를 이용한 양파분말 제조의 가능성을 제시하고자 하였다. 흡습특성은 양파 건조분말 3종류를 25℃(상대습도 11%)와 40℃(상대습도 75%)의 조건에서 0~48시간 동안 저장하며 수분, 겉보기밀도, 갈변도 및 색도를 조사하였다. 수분흡수량은 FD는 저장 2시간, SHD는 4시간, HD는 6시간 이후부터 흡수하기 시작했고 흡수량은 FD가 가장 높았다. 수분활성도 역시 FD는 저장 0시간, SHD는 4시간, HD는 6시간 이후부터 증가하기 시작했고 HD가 가장 높았다. 겉보기 밀도는 FD 대비 HD는 2배, SHD는 1.6배 높았으나 저장 후 수분흡수가 커짐에 따라 줄어드는 겉보기 밀도의 전후 차는 HD가 가장 높고 FD와 SHD는 유사하였다. 저장 전 후 갈변도는 25℃ 저장에서 FD와 SHD는 변화가 없었으나 40℃ 저장에서 SHD는 변화가 있었고 HD는 SHD의 1.6배 높은 값을 보였다. 따라서, HD 대비 수분함량 45%, 갈변 43% 감소시킨 SHD는 HD보다 흡습 특성이 우수하여 제품으로 가능성이 있다고 판단된다.

P2-57

Physicochemical characteristics of gluten-free vegan scones made of different rice flours

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Glutinous rice flour and non-glutinous rice flour were compared to make scone for vegans and a gluten-free product and some substitutes for ingredients of scone were also investigated for the gluten-free scone for vegans (GFVS). Milk and butter were substituted for soy milk and margarine. Xanthan gum and guar gum were added to give better structural stability and vanilla oil was also used for better flavor. The moisture contents of scone with glutinous rice (GRS) and scone with non-glutinous rice (NGRS) were higher than the control. The GRS had the highest pH value, but there were no significant differences between the control and NGRS. The dough with GRS had the highest density, but the control and NRS were not significantly different. The baking loss was the highest in the control and the lowest in NGRS. the value of L* and b* was high in control while NGRS had the least value of L* and b*. The value of a* was high in NGRS while the control had the lowest value of a*. In texture properties of the scones, the cohesiveness was the highest in the control and the lowest in NRS. In hardness, GRS did not show significant difference, compare to the control and NGRS and NGRS was higher than the control. In sensory evaluation, Puffiness is not significantly different among the samples. In flavor, the control did not show significant difference with GRS, and was higher than NGRS. The control and GRS showed higher score than NGRS in the overall acceptability. In conclusion, glutinous rice flour showed better quality than non-glutinous rice flour to make GFVS and the glutinous rice flour used in this study could be good to make GFVS.

P2-58

Quality characteristics of wheat according to drying temperature and drying time

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The effects of drying temperature and time on quality characteristics such as moisture content, color (L value: brightness), volume weight, and weight of thousand-kernel of Korean wheat were investigated. The drying was conducted using a circulating dryer at temperatures of 40℃, 45℃, 51℃, and 58℃ until moisture content of the grain reached at 12.5% (w.b.). The result of moisture contents measured by a single grain water meter indicated that initial contents of samples dried at both 40℃ and 58℃ were 17.0%. However, drying temperature led to different drying rate. The drying rate of 40℃ which was the lowest temperature was the lowest as 0.52%/h, while the rate of 58℃, namely the highest temperature, was the highest as 0.78%/h. The sample dried at 51℃ had the highest L value ranged 49.72~52.19. In addition, the reduction rates of the thousand-kernel weights of samples dried at 45℃ and 58℃ found be the lowest as 2.55% and highest as 5.98%, respectively. The volume weight of samples dried at all temperature increased with increasing initial temperature and time. Consequently, these results indicate that the drying temperature and time affect significantly the quality characteristics of Korean wheat.

P2-59

Evaluation of protein digestibility by the cooking method of chicken breast using *in vitro* digestion model

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Sarcopenia is a condition associated with progressive loss of skeletal muscle mass and strength/function in the group of elderly people (e.g., 65 years old) that exhibits the fastest growth rate in all population segments. The consumption of protein and improved digestibility are crucial for preventing

reduced lean body mass (loss of muscle tissue) in elderly people. We compared the protein digestibility of two cooking methods for chicken breast, the sous-vide process (SV) and the boiling process (B). Supernatants and solid pellets from the boiling process (B) and the sous-vide process (SV) were collected in the gastric digestion stage (G1h, G2h) and intestinal digestion stage (G1I1h, G1I2h, G2I1h, G2I2h), respectively. Then, we evaluated protein profile (SDS-PAGE), protein digestibility, total amino acid (TA), and total nitrogen (TN) content analysis. The total yield of trichloroacetic acid (TCA) soluble peptide and crude protein from SV were increased following digestion stages progressed in the supernatant and compared to those of boiled chicken breast (B). The weight of the SV pellet at the final stage of digestion, was significantly reduced and profiles of amino acids in SV supernatants were increased which indicates a more effective protein digestibility than the boiling process. Taken together, these results suggest that the sous-vide process could be more the elderly friendly cooking method for improving protein digestibility.

P2-60

Chemical properties to determine the freshness of chub mackerel (*Scomber japonicus*) at a fishery products auction house in communal fish market

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A major fishery products auction house in communal fish market in Busan is the endpoint of the production stage of fishery products and the starting point of the distribution stage in south region of Korea. It plays a key role in the distribution of fishery products as supplying large quantities of the fishery product, and it is where the price is determined. However, the primary sanitation management in the auction house might affect the freshness and quality of the fishery products for subsequent distribution and processing. Therefore, we analyze the quality control and sanitation management of chub mackerel (Scomber japonicus) in Busan (landing, sorting, display/auction, and packing). A food safety management system with considerable recognition and reliability is believed to be necessary to ensure that high-quality fishery products.

P2-61

Characteristics of gluten-free muffin made by thermally treated rice flour/protein composite

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This study was carried out to investigate the physical properties of gluten-free muffin prepared by thermally treated rice flour and various protein. Gluten-free muffin made with rice flour (normal type) and protein (soy protein isolate and whey protein concentrate) blends with thermal treatment (for 4 and 8 hr at 50℃). The physical characteristics (weight, volume, and height), color properties, texture properties, and sensory evaluation of gluten-free muffin were investigated. The height of whey protein muffin (RW) was higher than that of soy protein muffin (RS), and there was no significant difference among the heat-treated muffins. The yellowness ($b*$) of RW was higher than RS, and the heat-treated muffins were significantly decreased for yellowness with crust samples. The RW had higher hardness than the RS, and heat treatment led to muffins with lower hardness in texture properties. After storage (for 3 days at 4℃), hardness of gluten-free muffin made with thermally treated rice flour and whey protein had lower than that of RS with heat treatment. The overall acceptability in sensory evaluation of heat-treated muffin with whey protein was higher than that of the un-heat-treated muffin. Thermally treated rice flour/whey protein composite seems to be a valuable procedure to improve the gluten-free muffin and exhibit a great potential for application in bakery products.

P2-62

3D printing of cellulose microfibrils with locust bean gum

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The 3D bio-printing in technology, which can produce three-dimensional structures using natural polysaccharides, has attracted the attention of many researchers due to its excellent gel formation, nontoxicity, and high biocompatibility. In this study, the cellulose microfibrils (CMF) made from leaf bleached kraft pulp and locust bean gum (LBG) enables to be used as bio-derived material for the 3D printing by establishing interpenetrating polymer

network.In order to confirm the materials' properties, tthe structural, rheological, and morphological properties which are required for 3D bio-printing were investigated by mixing 1-7% of LBG with 1% CMF. Overall, 3-5% addition of LBG to CMF showed smoother/homogeneous surfaces with increased storage modulus, implying proper incorporations of LBG into CMF networks. Also, the lowest dimensional error after 3D printing, which indicates the optimal conformity in designed 3D printing, was obtained when using 1% CMF with 4% LBG hydrogel at optimized conditions at 10 mm/s printing speed, 50% infill density, 0.8 mm nozzle diameter, and 0.4 mm layer height. In conclusion, the hydrogels consisting of CMF and LBG have sufficient potential as a bioink for 3D printing.

P2-63

Study on the manufacturing method of soymilk using gyeonggi kidney beans (*Jagang, Heukgang, Yuldu, Sinseondu*)

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The objective of this study was to make kindey soymilks from 4 types of Gyeonggi kidney beans(*Jagang, Heukgang, Yuldu, Sinseondu*)

For the manufacturing the optimal kidney beans soymilk, we investigated the general and functional components of 4 types of Gyeonggi kidney beans(*Jagang, Heukgang, Yuldu, Sinseondu*)

Firstly, as a general components, the moisture of Gyeonggi kidney beans was 12.14, 13.46, 10.83, 12.40% respectively.(*Jagang, Heukgang, Yuldu, Sinseondu*) and the total sugar content was in the range of 11.32 ~ 20.37%. The crude protein content was in the range of 18.1 ~ 20.9% and the crude fat was in the range of 1.1 ~ 2.6%

Secondly, as a results of analyzing the functionality of Gyeonggi kidney beans, the antioxidative antioxidative activity(ABTs, DPPH, radical scavenging activity) was the highest in *Jagang*(82.47, 99.28% respectively) and total polyphenol contents was the highest in *Yuldu*(4,318 ppm)

In this study, to make healthy Gyeonggi kidney beans soymilk with reduced artificial sugar adding content, we treated with three types of enzyme(α-amylase, β-amylase and mixed) and compared the characteristics with commercial soymilk.

P2-64

비건 스프레드의 제조 및 물리적 특성 평가

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Coconut oil, shea butter, avocado oil의 비율을 다르게 혼합한 3종류 fat(VLBs)의 물리적 특성을 대조군(commercial spread, CS)의 추출지방과 비교하고, VLB 60% 함유 비건 스프레드를 3종 제조하여 물리적 특성을 조사하였다. VLBs의 주요 지방산은 lauric(14.1~23.2%), myristic(5.3~8.8%), stearic(1.9~14.7%), oleic acid(32.1~39.2%)이었다. VLBs의 melting point는 18.5~20.0℃으로 각 VLB간의 유의적인 차이는 없고(p>0.05), CS fat(14.5℃)보다 유의적으로 높았다(p<0.05). Differential scanning calorimetry(DSC)으로 분석한 solid fat content(SFC) 결과에 의하면, CS fat과 VLBs은 0~10℃ 구간에서 급격히 융해되어, 15℃에서는 모두 액화되었다. VLBs의 SFC는 5℃에서 50.1~54.6%, 10℃에서 15.0~29.9%, 15℃에서 0.7~4.1%이고, CS fat의 SFC는 5℃에서 35.8%, 10℃에서 12.0%, 15℃에서는 0%으로, VLBs는 commercial spread의 지방보다 각 측정온도에서 고체지방함량이 높았다. Texture analysis 결과, VLBs으로 제조한 비건 스프레드의 cutting force, firmness, spreadability, adhesiveness는 commercial spread보다 높고, cohesivness는 낮았으며, 비건 스프레드는 melting point가 높고, 상온에서 천천히 액체화되며, 단단하지만 높은 spreadability를 가진다. 유지방 대체 방안으로 식물성 고체지인 coconut oil, shea butter와 액체유인 avocado oil의 적절한 blend 유지는 비건 스프레드 제조를 위한 주요 유지 소재로 사용될 수 있다.

P2-65

추출조건별 물리·화학적 특성 및 항산화 활성을 통한 잇바디 돌김 유래 기능성 다당류의 최적 추출조건 확립

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김의 다당류는 3, 6-anhydro-*L*-galactose (*L*-AHG), 갈락토스 및 황산염으로 구성된 산성 갈락탄이다. 김의 기능성 다당류의 연구로는 *L*-AHG 및 황산염 함량과 관련하여 항산화 활성, 면역증강 기능 등이 보고되고 있다. 하지만 추출 용매에 따른 구성성분 차이 및 생체 활동 (Biological activity)에 대한 연구는 미비하다. 따라서, 본 연구에서는 잇바디돌김 (*Porphyra dentata*)을 소재로 하여 다양한 추출조건으로부터 *L*-AHG 및 황산염 함량을 조사하고, 그에 따른 항산화 활성을 평가하였다. 또한, 추출 용매별 최적의 추출조건으로 대량 추출하여 얻은 잇바디돌김 유래 다당류의 화학적 특성 및 항산화 활성을 비교·평가하여 최종적으로 기능성 다당류를 얻기 위한 최적의 추출 방법을 확립하였다. 잇바

디돌김 유래 다당류는 3시간 동안 다양한 온도에서 물, 초음파, 산, 및 알칼리 추출을 통해 얻었다. 실험 결과, 전반적으로 산 추출법을 제외한 다른 추출법들에서는 온도가 낮을수록 *L*-AHG, 황산염 함량 및 분자량 크기가 높게 측정되었다. 항산화 활성은 *L*-AHG 및 황산염 함량이 증가함에 따라 활성이 높았다. 따라서 25℃, 3시간 추출조건에서 대량 추출하였으며, 구성성분 측정 결과 알칼리 추출법이 *L*-AHG 및 황산염 함량이 높았다. 또한, 항산화 측정 결과 알칼리 추출이 가장 높은 활성을 보였다. 결론적으로 본 연구에서 *L*-AHG 및 황산염이 많이 함유된 알칼리 추출법이 높은 항산화 활성을 갖는 기능성 다당류를 추출하는 최적의 추출법임을 시사한다.

P2-66

Thawing quality characteristics of frozen pork according to the vacuum of a 100 L scale tumbler

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As the amount of domestic pork imports and the variety of meat processed products increase, there is a need for extensive research on thawing conditions after importation. Based on the potential industrialization and the characteristics of the research subjects and processes, the development of a 100 L scale tumbler was initiated. This was done with the cooperation of a private company to establish an effective R&D and industrialization strategy. In this study, the thawing quality characteristics of frozen pork based on the vacuum (0, -35, -55 and -75 kPa) of a 100 L scale tumbler were comparatively analyzed. According to the results, the fastest thawing time was obtained at -75 kPa. Moreover, the lowest drip loss (0.3%) and cooking loss was also recorded at -75 kPa. On the other hand, highest WHC (93.43%) and moisture content (93.4%) was seen in 75 kPa. The pH trend showed a tendency to decrease as vacuum increases. In terms of chromaticity, both L (lightness) and b (yellowness) increased as the as the vacuum decreases while a (redness) increased as the vacuum increases. In the future, it is expected that the optimal thawing conditions can be established by analyzing the thawing quality characteristics according to the amount of steam, rpm, and temperature that can be set in the 100 L Scale tumbler.

P2-67

Kinetic modeling of dieckol extraction from *Ecklonia cava* by ultrasound-assisted extraction: Comparison of extraction solvents

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Deep eutectic solvents (DES) are emerging as green and sustainable solvents for the efficient extraction of bioactive compounds or antioxidants. In this study, dieckol was extracted from Ecklonia cava using ethanol and DES solvents, and kinetic modeling was applied to compare their extraction efficiency. Among the DES matrix evaluated, choline chloride and acetic acid combinations had higher dieckol extraction efficiency. Ultrasonic-aided extraction was performed using diluted solutions of DES solvent (20%, 40%, and 60%) compared with 95% ethanol. Kinetic modeling was applied for an extraction time of 1 min, 3 min, 5 min, 7 min, and 9 min for kinetic modeling, and dieckol contents in the extracts were quantified using HPLC. At 1 min, the content of dieckol was higher in diluted DES solutions (24.5-24.9 mg/g) than in 95% ethanol (14.5 mg/g). At 9 minutes, the content of dieckol in 20%, 40% and 60% DES solutions was 24.4 mg/g, 27.5 mg/g, and 26.0 mg/g, respectively, and 18.3 mg/g in 95% ethanol. The kinetic modeling data confirmed that the DES solvent used in this present study (especially 40% DES solution) expedited the extraction of dieckol from Ecklonia cava compared to the commonly used ethanol solvent.

P2-68

Quality characteristics of eggless muffins prepared using alternative egg solutions containing super mealworm protein isolate and carrageenan

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This study investigated the feasibility of preparing muffins using alternative

egg solutions consisting of isolated super mealworm protein (2.3 and 4.3%) and carrageenan (0.5, 1.0 and 2.0%). Carrageenan solutions and protein isolate powder were homogenized to produce a consistent solution, and was used to replace in the muffin formulation. Quality assessments of muffins physical and nutritional properties of the developed eggless muffins including texture profile, protein content and digestibility, were compared with muffins containing egg. The eggless muffins prepared showed similar protein contents and springiness with the muffin containing egg. In addition, increased concentration of carrageenan increased chewiness and cohesiveness. However, eggless muffins had higher protein digestibility compared to the muffin with egg. Among the alternative egg solutions evaluated, muffins prepared with 0.5% carrageenan and 4.3% super mealworm protein solution showed comparable good characteristics with egg-muffins. In all, the present results suggest that alternative egg solutions of super mealworm protein and carrageenan could be a superior alternative for preparing eggless muffins.

P2-69

Tailored extraction of okra pectin as a clean-label emulsifier

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The development of clean label products is of growing interest, especially in emulsion-based foods where additives are required to ensure stability during processing and storage. Pectin, an important cell wall component has proven to be feasible as a food-grade emulsifier. Moreover, the specific modification of pectin structure could impact novel and desirable functionalities. In this study, okra pectin was investigated for its potential as a food-grade emulsion stabilizer. To achieve this goal, an in-depth understanding of the structure-emulsifying performance relationship via targeted modifications of the pectin structures was performed, which revealed the compositions of side-chain sugars (galactose and arabinose) in the pectin structure predominantly influence emulsifying properties of okra pectin. Thereafter, a tailored-enzymatic extraction using costumed multi-enzymes was used to obtain clean-label okra pectin with improved emulsion stability indices, as determined by an

oil-in-water emulsion storage experiment. The results obtained in this study provide theoretical and practical knowledge on the application of okra pectin as a clean label ingredient, which could serve as a suitable alternative to chemically modified starches and other artificial emulsifiers used in various food-related applications.

P2-70

Protein enrichment of gluten-free pancakes with corn flour using edible insect protein isolate

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Entomophagy has been in existence for tens of thousands of years and they still retain an important place as a traditional food in many parts of the world. The gluten-free diet has gained popularity over the years due to health hazards caused by gluten content foods. However, most people still have their reservations for entomophagy when it comes to the colour,smell, and taste. This study aimed at developing a protein enriched and gluten-free pancakes using protein isolates from two different edible insects largely consumed all over the world, that is the cricket and mealworm by incorporating them at different concentrations of 1, 3, and 5%. The proximate composition, functional properties, and sensory parameters were evaluated to determine the nutritional and quality of the pancakes. The replacement of wheat flour with corn flour and the inclusion of the protein isolates showed lesser values than control in textural properties which means there is an improvement in the textural properties of the treatments than in control and functional properties showed higher values in mealworm (1, 3, and 5%) incorporated in corn flour pancake. The results of the protein content and sensory evaluation of cricket and mealworm at different concentrations showed higher content of protein than control, all treatments were generally accepted but mealworm (1 and 5%) showed the highest acceptability ratio. In conclusion, this study shows that incorporation of mealworm at different concentrations 1, 3, and 5% has better functional, nutritional and protein rich pancakes with improved quality.

P2-71

천마를 이용한 어린이용 건강음료의 품질 특성 및 항산화 활성

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천마가 가지는 특유의 불쾌한 맛과 향을 감소시킬 수 있는 전처리 조건을 이용하여 추출한 천마추출액과 기억력 감퇴와 건망증에 효능이 있는 총명탕을 배합하여 기억력 향상 및 학습능력 증진 효능을 강화시킨 어린이용 건강음료를 개발하기 위한 기초자료로 제시하고자 한다. 총명탕 제조에 선별된 한약재는 원지, 석창포, 백복령, 대추, 감초, 건강, 당귀, 맥문동, 산조인, 황기, 용안육이다. 예비실험을 통해 한약재의 배합비를 결정하였으며 추출조건은 가수량 30배, 추출온도 95℃, 추출시간 4시간으로 선택되었다. 천마추출액과 총명탕의 비율을 달리하여 A(천마추출액 6 : 총명탕 및 부원료 4), B(천마추출액 5 : 총명탕 및 부원료 5), C(천마추출액 4 : 총명탕 및 부원료 6) 3가지 건강음료를 제조하였으며 당도, 총당 함량, 환원당 함량, pH, 산도, 총페놀 함량, 총플라보노이드 함량 분석 및 관능평가를 실시하였다. 당도는 11.75~12.40 °Brix, 총당 함량은 12.81~13.59 g/100g, 환원당 함량은 2.35~2.52 g/100g으로 천마추출액의 비율이 낮아질수록 감소하는 경향이 나타났다. pH는 4.27~4.65, 총산은 0.15~0.17%로 실험군간의 큰 차이는 없었으며 총페놀 함량은 95.49~112.02 mg/100g, 총플라보노이드 함량은 19.74~21.48 mg/100g으로 천마추출액의 비율이 높을수록 높은 값이 나타났다. 관능평가를 통해 색, 향, 맛, 전체적인 기호도를 측정하였으며 그 결과 기호도가 가장 높은 B(천마추출액 5 : 총명탕 및 부원료 5)를 최종 배합비로 선택하였다.

P2-72

Quality properties and food materials development of *Mycoleptodonoides aitchisonii*

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The organisms of the fungus include mushrooms, rusts, smuts, puffballs, truffles, morels, and yeasts, as well as many less well known organisms. More than 70,000 species of fungi have been described. However, some estimates of total numbers suggests that 1.5 million species may exist. Edible mushroom have for a long time been recognized not only as a delicious foods, but also for their use as food in human's diets. Mushrooms have been found to be rich

sources of protein, lipids, amino acids, glycogen, vitamins and mineral elements. According to Rambeli, the mineral content of mushrooms is superior to that of meat and fish and nearly twice that of the most common vegetables.

Mycoleptodonoides aitchisonii (Berk.) Maas Geest. (*M. atichisonii*) is a mushroom that belongs to the Climacodontaceae family. *M. aitchisonii* is recognized as a nutritious food source that has previously been reported to possess excellent source of bioactive properties. The purpose of this study was to investigate the quality properties of *M. aitchisonii* for development as food materials. The results showed that of *M. aitchisonii* contained 16 kinds of amino acids and β-glucan. Also, ergosterol content was significantly higher than that of other mushrooms. This results will be used as an indicator of the nutritional value of *M. aitchisonii.* We suggest that the results will provide valuable information to development new foods. Accordingly, *Mycoleptodonoides aitchisonii* was registered as a temporary raw material by the Ministry of Food and Drug Safety in september 2020. Moreover, it is expected to be used as a functional food material through efficacy confirmation and useful ingredient analysis.

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P2-73

Physical properties by different parts and heat treatments for standardization of the quality of production *Lentinula edodes* with smart farm application

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The oak mushroom (*Lentinula edodes*) contains unique aroma and flavor and has high preference due to contain useful components. But production efficiency is decreasing with labor-intensive production methods, aging of farmers, and difficulties in supply and demand of inoculated trees. Therefore, it is necessary to establish the log cultivation of *L. edodes* smart farm incorporating ICT technology for efficient high-quality *L. edodes* production.

Recently, research on growth and environmental information (temperature, carbon dioxide), and production technology using the ICT technology was promoted recently. In addition, standardization of quality is required for stable consumption of *L. edodes.* research on growth and environmental information (temperature, carbon dioxide), and production technology using the ICT technology was promoted recently.

This study performed with the process of roasting and blanching by separating the cap and stems of *L. edodes,* also, the physical properties were measured. The results of hardness, gumminess, and chewiness decreased with increasing roasting time, but increased with longer blanching time. Fracturability, springiness, resilience, and cohesiveness showed almost constant values regardless of conditions. It was confirmed that the hardness increased as the structure became dense due to shrinkage due to drying by evaporation of moisture through blanching, and the hardness increased as the moisture content increased as the roasting time increased. Therefore, when the log cultivation of *L. edodes* smart farm incorporating ICT technology spreads, we expect to create a new type of working environment, improve productivity, and strengthen the competitiveness of agriculture.

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P2-74

Effect of Enzymatic Hydrolysis by Crown Flower Plants and Papain Protease on Characteristics and Antioxidant Activities of Milkfish (*Chanos chanos Sp*) Protein.

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The exploration of effective and safe sources of natural antioxidants is needed to develop due to its essential role in food preservation and contributing to health promotion. One source of natural antioxidants that has

the potential to be developed is the fish protein hydrolysates. This study aims to observe the antioxidant activities and characteristics of milkfish protein hydrolysates (MPH) hydrolyzed by papain and crown flower plants protease. In this study, Milkfish protein hydrolysates were prepared by hydrolysis using a combination protease of Papain (P) and Crown flower plants or Biduri (B) with the experiment combinations were 70%P:30%B, 60%P:40%B, 50%P:50%B, 40%P:60%B, 30P:70%B. The combination of 60% papain and 40% crown flower plants protease obtained MPH with the highest values of protein content, degree of hydrolysis, antioxidant activity by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method and reducing power absorbance of 75.71%, 90.12%, 57.38% and 0.336 respectively. The same combination of enzymes obtained MPH with solubility and water holding capacity of 75.71% and 90.12%, respectively and a molecular weight of 6.1 kDa.

포스터 발표 논문 초록 PART Ⅲ

화학/분석 분야

POSTER NO. P3-1~P3-20

P3-1

영지버섯으로 고체발효시킨 꾸지뽕나무 잔가지 (Twig)에서 생물전환 생성물들의 분리 및 구조동정

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뽕나무과 (Moraceae)에 속하는 꾸지뽕나무 (*Maclura tricuspidata* (Carr.) Bur. formerly *Cudrania tricuspidata*)는 전통적으로 열매, 잎, 가지, 줄기, 껍질 및 뿌리 등 전 부위를 식용 또는 약용으로 이용되어 왔고, 최근에는 꾸지뽕 잎 추출물이 식약처로부터 개별인정형 기능성원료로 인정을 받았다. 꾸지뽕나무에서는 최근까지 440여종의 phytochemical들이 밝혀져 있으며, 그의 조성이나 함량은 부위에 따라 많은 차이가 있는 것으로 밝혀져 있다. 본 연구에서는 꾸지뽕나무 재배동안 가지치기 과정에서 부산물로 산출되는 잔가지를 영지버섯 (*Ganoderma lucidum*)으로 고체발효 (solid-state fermentation)시킨 다음 무처리구와 발효시료를 UPLC-QTOF-MS로 분석하여 60여종의 성분을 잠정적으로 동정하였다. 또한 잔가지의 발효시료에서 양적으로 많이 검출된 생물전환 생성물들을 chromatography(silica gel, Toyopearl HW-40S, Sephadex LH 20)에 의해 단일성분으로 분리한 다음 기기분석 (UV profile, QTOF-MS, ^{1}H-NMR, ^{13}C-NMR)을 통하여 8종의 성분을 구조를 동정하였다. 이들은 각각 dihydrokaempferol, kaempferol, taxifolin, epitaxifolin, quercetin, gastrodin, *p*-hydrozybenyl alcohol 및 *p*-hydroxybenzaldehyde인 것으로 밝혀졌으며, 그 중에서도 특히 dihydrokaempferol의 생성량이 높았다. 이들은 영지버섯에 의한 고체발효과정에서 영지버섯 균사체가 분비하는 β-glycosidase에 의해 잔가지에 함유된 배당체들(glycosidic forms)이 유리형 (free forms)으로 가수분해되어 생성되는 것으로 밝혀졌다. 일반적으로 식t물체에 함유된 생리활성 성분들은 배당체형보다 유리형의 형태로 존재할 때 생리활성이 보다 강해지는 것으로 알려져 있기 때문에 유리형의 생리활성물질들의 함량이 증가된 발효 꾸지뽕나무 잔가지의 생리활성에 대한 추가실험이 필요할 것으로 판단된다.

P3-2

꾸지뽕나무 잔가지 (twig)에서 Parishin 유도체의 분리동정 및 천마와 Parishin 유도체의 함량 비교

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꾸지뽕나무 (*Maclura tricuspidata* (Carr.) Bur.)에는 xanthone류, flavonoid류, phenylpropanoid류와 같은 다양한 생리활성성분들이 함유되어 있는 것으로 밝혀져 있으며, 이러한 성분들은 꾸지뽕나무의 다양한 생리활성 발현에 직간접적으로 기여한다. 저자들은 최근에 꾸지뽕나무 잔가지의 생리활성 성분에 관한 연구과정에서 꾸지뽕나무에서는 지금까지 보고되지 않은 parishin 유도체들이 다량으로 함유되어 있을 가능성을 제시하였으며, 이들의 정확한 구조를 동정하기 위하여 잔가지에서 7종의 parishin 유도체를 단일성분 수준으로 분리한 다음 UV profile, HPLC-MS, QTOF-MS, NMR 분석에 의한 구조동정 결과 이들 중 5종은 각각 parishin A [tris[4-(β-D-glucopyranosyl)benzyloxy]citrate], parishin B, parishin C, gastrodin [4-(hydroxymethyl)phenyl β-D-glucopyranoside] 및 4-hydroxybenzyl alcohol (4-HBA)인 것으로 밝혀졌고, 나머지 2종은 지금까지 천연물에서 보고되지 않은 신규 parishin 유도체 (UK-2, UK-3)로 추정하여 현재 이들의 구조를 동정 중에 있다. 특히 parishin 유도체들은 한방에서 전통적으로 뇌신경질환의 치료 및 개선에 널리 이용되는 천마 (*Gastrodia elata*)에 특징적으로 발견된 성분들이다. 따라서 꾸지뽕 잔가지와 생천마의 동결건조품 및 시판 천마분말에서 parishin 유도체들의 조성과 함량을 비교한 결과 천마의 동결건조품에서는 꾸지뽕나무 잔가지보다 parishin A, B, E 및 4-HBA의 함량이 다소 높은 편이었으나 꾸지뽕 잔가지에서는 천마에 의해 gastrodin의 함량이 높았다. 또한 HPLC-MS 분석에 의해 잠정적으로 동정된 parishin L로 천마에서만 검출되었고, UK-2와 UK-3 성분은 꾸지뽕나무 잔가지에서만 검출되었다. 이러한 결과에 비추어 꾸지뽕나무 잔가지는 천마와 유사한 용도로 약용 및 건강기능식품 원료로 사용 가능한 잠재력을 지니고 있다고 할 수 있다.

P3-3

대파 건조 조건에 따른 thiamethoxam의 잔류량 변화

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본 연구는 대파 건조 조건에 따른 thiamethoxam 농약의 잔류량 변화를 비교하기 위하

여 수행하였다. 대파에 thiamethoxam 농약(20%, WG)을 0.071 kg ai/10a의 비율로 1회 살포한 시료를 사용하였다. 건조 방법은 항온 건조와 단계별 건조로 가공하였다. 항온건조는 손질한 대파를 8 mm 간격으로 절단한 후 65, 70, 75, 80, 85, 90 및 95℃로 건조하였으며, 단계별 건조는 1차, 2차, 3차 건조 온도를 달리하여 각각 90-70-70℃, 85-80-75℃, 95-85-80℃, 95-90-85℃의 조건으로 각각 건조하여 분석하였다. Thiamethoxam을 살포한 시료의 농약 잔류량은 0.45 mg/kg이었다. 65, 70, 75, 80, 85, 90 및 95℃로 건조한 후 농약의 잔류량은 각각 3.85, 3.14, 3.16, 3.30, 4.13, 3.70 및 2.68 mg/kg으로 나타났다. 90-70-70℃로 단계별로 건조한 후 농약의 잔류량은 3.78 mg/kg이었으며, 85-80-75℃, 95-85-80℃ 및 95-90-85℃로 건조한 후 잔류량은 각각 3.53, 4.78 및 4.02 mg/kg으로 나타났다. 건조 조건을 달리하여 대파를 건조하였을 때 초기 잔류량 대비 6배 이상 농축되는 결과를 보였으며, 그중 95℃로 건조한 경우 가장 낮은 잔류량을 나타내었다.

P3-4

방사무늬김(*Pyropia yezoensis*)과 잇바디돌김(*Pyropia dentata*)의 성분학적 특성 비교

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김 (*Pyropia* spp.)은 홍조류에 속하는 대표적인 해조류로, 한국, 중국, 일본에서 주로 소비되고 있으며 최근 유럽, 미국 등의 서양에서도 기호식품으로 그 소비가 증가하고 있는 추세이다. 김에는 다당류, 단백질, 무기질, 비타민, mycosprorine-like amino acid류 (MAA), 그리고 고도불포화지방산 등의 유용성분을 함유하고 있다. 이러한 성분 함량은 품종 및 재배환경에 따라 큰 차이가 있다. 방사무늬김과 잇바디돌김은 우리나라에서 널리 소비되고 있으나 이들 품종의 품질 관리를 위한 성분학적 연구는 미흡한 실정이다. 그래서, 본 연구에서는 시중에 판매되고 있는 44종의 방사무늬김과 잇바디돌김을 대상으로 대사체 및 다변량 통계 분석을 통해 성분학적 특성을 파악하고자 하였다. UPLC-ESI-Q-TOF-MS를 이용하여 김 대사체 분석을 실시한 한 다음 OPLS-DA를 분석한 결과, 두 품종은 확연하게 구별됨을 확인할 수 있었다. 두 품종을 구별하는 주요 성분들은 현재 동정 중에 있다. 또한, 김의 대표적인 MAA인 shinorine과 porphyra-334를 LC-MS를 이용하여 정량하였다. 그 결과, 두 성분 모두 방사무늬김에 비해 잇바디돌김에서 높은 함량이었으며, 특히 shinorine의 함량은 잇바디돌김이 방사무늬김 보다 월등히 높았다. 방사무늬김과 잇바디돌김의 구성 아미노산 함량은 거의 유사하였으며, 이 중 glutamic acid, alanine, aspartic acid는 주요 구성 아미노산임을 알 수 있었다. 구성 아미노산 함량에 대한 PLS-DA 결과, 두 품종이 구별되고, valine, glycine, proline, isoleucine, threonine, leucine이 두 품종을 구별하는 주요아미노산임을 확인하였다.

P3-5

Hazard substance analysis by polycyclic aromatic hydrocarbons (PAHs) study

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Polycyclic aromatic hydrocarbons(PAHs) are organic compounds in which two or more benzene rings are linearly angled or densely formed, and are released as by-products when chemical combustion or incomplete combustion of organic materials is carried out. As a result, PAHs may be present in food, air, soil, and water, and may be contaminated with the human body through food cooking and processing processes. In particular, PAHs are known to be carcinogenic when exposed to humans. Therefore, safety management is of great importance in food. In this study, perfomance paremeters were obtained through GC/MS to develop the analyrtical method for PAHs. Apple juice, red bean porridge, avocado, and canola oil were used as representitive food matrix. LOD/LOQ values of the sample were 0.01 to 0.84, the accuracy was ranged from 90.01 to 109.6%, and the precision was less than 9%.

P3-6

국내 농식품자원에서의 인지질의 정성 및 정량분석

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난황(황색란, 훈제란, 백색란), 곡류 제품(백미가루, 밀가루 박력분, 소면), 두류(검은콩가루)와 조미료(생강가루)에 함유된 인지질의 정성 및 정량을 dial column을 장착한 HPLC-ELSD를 이용하여 분석하였다. Phosphatidylethanolamine(PE), phosphatidylcholine(PC), phsphatidylserine(PS), lyso-phosphatidylcholine(LPC), N-acyl-phosphatidylethanolamine (NAPE) standard curve는 linearity를 보이고, R^2은 >0.98이었다. HPLC-ELSD 분석시 인지질의 검출한계(LOD)는 LPC(0.53 mg/100g), PS(5.36 mg/100g), PC(6.28 mg/100g), PE(9.20 mg/100g) 이고, 정량한계(LOQ)는 LPC(4.00 mg/100g), PS(6.94 mg/100g), PC(8.37 mg/100g), PE(12.33 mg/100g)이었다. 난황에는 PC(80.96~95.29 mg/g)와 PE(10.98~17.13 mg/g)의 함량이 가장 높고, LPC(1.56~2.61 mg/g)와 spingomyelin(SM)은 미량 함유되었다. 곡류 제품에서는 NAPE, PC와 LPC가 분석되었는데, 박력분에서는 PC(0.07~2.47 mg/g), 백미에서는 LPC(0.56~1.04 mg/g)의 함량이 비교적 높고, 소면과 박력분에는 NAPE, 쌀에는 phosphatidylinositol(PI)가 미량 함유되었다. 검은 콩가루에는 PE(2.52 mg/g)와 PC(5.49

mg/g), 생강가루에는 PC(1.09mg/g)가 정량되었다. 인지질은 HPLC-ELSD 분석시 특이성이 있어 정성이 가능하고, 분석된 각 인지질의 직선성과 높은 R2으로 정량이 가능하여, 본 연구에서 정립한 분석방법으로 국내 다양한 농식품자원의 인지질의 조성과 함량 정보를 수립할 수 있을 것이다.

P3-7

Comparison of two extraction methods (solvent and enzyme hydrolysis) on vitamin K (phylloquinone and menaquinone) analysis in 6 kinds of seafood products

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Seafood products are one of the important nutrient sources in Korea, accounting to 39% of animal protein supply. Based from a report, the per capita intake of seafood by Koreans amounts to 58.4 kg/year which ranks first in the world. However, due to the limited information available regarding the micronutrient content of seafood products, there is a need to create a database on fat-soluble vitamins and to develop an effective extraction method especially for fishery products which has various and complex components. Therefore, in this study, two methods (solvent extraction and enzyme extraction) were tested and compared in 6 kinds (fish, shellfish, cephalopod, crustacean, seaweed, processed seafood products (dried products, salted products, etc.)) of seafood products. Based on the results, vitamin E detection was high in solvent extraction method when the fat content is less than 5%. However, when the fat content is greater than 5%, detection was high in enzyme extraction method. Therefore, vitamin K (phylloquinone and menaquinone) extraction methods were applied on the seafood products based on their fat content. According to the method verification, the analysis of the accuracy of phylloquinone and menaquinone satisfied the AOAC criteria. Furthermore, the recovery rate of the phylloquinone and menaquinone of the standard material is 90.1-92.3%, which is within the AOAC standard. Results showed that the total phylloquinone and menaquinone contents of the seafood samples ranged from 0.00-263.23 μg/100g and 0.000-4.43 μg/100g, respectively. Moreover, the recovery rates ranged from 73.3-97.9% for phylloquinone and 83.0-97.7% for menaquinone showing relatively high values which is also within the acceptable range (1 μg/ 70-125% at 100 g, and 80-115% at 10 μg/100 g). Therefore, the results of this study can

be used in extracting Vitamin K in other seafood products thereby contributing in the creation of national database.

P3-8

Detection of glucose, lactic acid, and urea using SWCNT based biosensor

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Recently, biosensor for detection of nutrients in food is one of attractive innovation four generation due to real time monitoring. It is necessary to develop a high-sensitive biosensor for detection of food components. In this study, Single walled carbon nano tube (SWCNT) based biosensor with high sensitivity was developed to detect glucose (Glu), lactic acid (Lac), and urea (Ure). Presented in this work is the development of a simple and highly sensitive D-glucose biosensor containing glucose oxidase (Gox), lactate oxidase (Lox), and urease (Urs)-immobilized on SWNTs, respectively. Employing simple directed assembly and non-covalent functionlization process these fabricated Gox, Lox, and Urs modified SWNTs-based biosensors were designed with two electrode terminals to allow continuous resistance response monitoring for the detection of Glu, Lac, and Ure, respectively. The developed biosensor had detection range in small size can make this biosensor potentially useful for in-vivo mode applications. SWCNT, 1-pyrenebutanoic acid, succinimide as electron transfer mediator, 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC)/N-hydroxy succinimide (NHS) as linker, and three enzymes (Gox, Lox, and Urs) as acceptors, were step by step immobilized in the manufacturing process of biosensor. It was confirmed that the developed biosensor enabled the detection of three target metabolites (Glu, Lac, and Ure) in food components. Therefore, it is expected that this study can be used as a basic study for food assessment in large industry.

P3-9

유색마 유전자원의 이화학적 특성 분석

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한국에서 주로 재배되고 있는 마는 주로 단마, 장마, 둥근마로 흰색의 육질을 가지고 있으며 약용작물 및 식품으로 사용되고 있다. 기존의 마 소비는 마에 함유된 뮤신을 섭취하여 위 건강에 도움을 얻고자 하였다. 이러한 마의 뮤신은 독특한 물리적 특성을 가지며 다른 전분질 재료와는 상이한 가공적성을 가져 이용에 한계가 있었다. 최근 식물체 색소성분의 건강기능적 특성이 부각되면서 색소성분을 가진 마에 대한 관심이 증가하고 있어 경상북도농업기술원 생물자원연구소에서 보유하고 있는 유전자원의 이화학적 특성을 분석하였다. 분석용 시료는 생체를 동결건조하고 분쇄하여 사용하였다. 색도 측정은 Spectrophotometer CM-700d(KONICA MINOLTA, Japan)를 사용하여 L, a, b값으로 표현하였다. 안토시아닌 함량은 시료 10g을 용매(Ethanol:H2O:HCl=20:79:1) 50ml에 추출한 후 HPLC로 분석하였다. 베타카로틴은 시료 분말 2g에 ethanol 20ml에 추출한 후 60% KOH용액을 사용하여 검화하고 2% NaCl용액 30 mL를 첨가하고 hexane과 ethyl acetate로 층분리하여 상등액을 HPLC로 분석하였다. 수분함량은 70~90g/100g, 조단백은 0.8~4.4, 조지방 0.02~0.1, 회분 0.5~1.2의 분포를 보였다. 무기성분은 칼슘 62.81, 철 0.51, 칼륨 231.30, 마그네슘 16.02, 나트륨 18.81, 인 115.48g/100g으로 칼륨이 가장 많은 비중을 차지 하였다. 당류는 주로 과당이 미량 함유되었으며 일부 포도당이 존재하는 자원도 있었다. 안토시아닌은 a-값과의 상관계수가 0.82이였고 베타카로틴은 b-값과의 상관계수가 0.56, 플라보노이드는 b-값과 상관계수가 0.56으로 색소물질과 색도는 안토시아닌에서 높은 상관관계를 보였다. 유색마를 식품소재로 활용하기 위한 기초자료를 제공하고자 하였으며 가공특성에 대한 연구가 지속적으로 이루어져야 할 것으로 여겨진다.

P3-10

Determination of viamin B_1 and B_3 contained in meats and processed meats

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Vitamin B1(thiamin) and B3(Niacin) are water-soluble vitamins that play a crucial role in the energy metabolism and maintaining proper nervous system function. These vitamins are micronutrients, but they must be consumed to maintain health, so sufficient intake through food or health supplements is required. Nutritional information on domestic food resources has been provided in the 「Korean food composition table」. However, the domestic data

self-sufficiency rate for trace elements such as vitamins is very low at about 30%, so it is necessary to secure data for national health management. Therefore, in this study, HPLC-DAD method for vitamin B_1 and B_3 was established, and the vitamin B_1 and B_3 contents of Meat and the processed Meat were analyzed. Meat foods with high vitamin B_1 content were beef jerky (7.74mg/100g) and smoked chicken breast (0.70mg/100g). Nicotinic acid and nicotinamide are collectively termed niacin. First, nicotinic acid was abundantly contained in Chicken skewers (22.62mg/100g), smoked chicken breast (21.66mg/100g), and raw beef liver (17.32mg/100g). The content of nicotinamide was high in beef liver (23.61～15.09mg/100g), roast chicken (13.6～6.51mg/100g), and smoked chicken breast (9.77mg/100g). For analysis quality control, a consistent level of analysis was maintained by analyzing blind samples (cereal + whole wheat + wheat flour) every time. The vitamin B_1 and B_3 reference standard data obtained as a result of this research will be included in Korean food composition table and provided to the public.

P3-11

Development of prediction model for capsaicinoid content of korean red-pepper powder with vrious cultivars by near-infrared spectroscopy

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Pungency is a unique characteristic of chili peppers caused by capsaicinoids. Red-pepper powder is one of the most frequently used ingredients of Korean food due to its unique pungency. The aim of this study was to predict the capsaicinoid content of red-pepper powder originated from 4 types of pepper (Dabok, Subicho, Yuwolcho, Chungyang) by combination of HPLC, FT-NIR spectroscopy and partial least square (PLS) regression model. The content of capsaicin, dihydrocapsaicin and total capsaicin could be measured using HPLC analysis, and these values were adopted as standard for prediction model. The NIR absorption spectra in the range of 4000 cm^{-1} – 10000 cm^{-1} were collected and prediction models were developed based on a PLS regression. The correlation coefficient (R^2) and root mean square errors of calibration (RMSEC) of the developed models with normal spectrum, first-order derivative and second-order derivative were 0.9980 and 47.1 mg/kg; 0.9998 and 14.2 mg/kg; 0.9983 and 45.7 mg/kg, respectively. These results proved that the combination of NIR spectroscopy and PLS regression can predict the capsaicinoid content of red-pepper powder with high accuracy and small error.

P3-12

유통 콜라겐 제품 중 중금속 함량 모니터링

김지은*, 김범호, 김경아, 김대환, 최영주, 강효정, 민지현, 이명진, 오조교

경기도보건환경연구원 보건연구기획팀

국내 유통 중인 콜라겐 제품 120건을 대상으로 중금속 4종(납, 카드뮴, 비소, 수은) 함량에 대해 조사하였다. 수은은 금아말감화법을 이용한 수은분석기로 분석하였고 납, 카드뮴, 비소는 ICP-OES를 이용하여 분석하였다. 검사 결과 건강기능식품 22건 중 6건, 기타가공품 68건 중 24건, 음료류 10건 중 5건, 과·채가공품 10건 중 3건, 캔디류 10건 중 1건에서 중금속이 검출되었다. 건강기능식품은 납, 카드뮴, 비소, 수은에 대해 각각 평균 0.108 mg/kg, 0.026 mg/kg, 0.091 mg/kg, 0.0012 mg/kg 농도로 검출되었고, 기타가

공품은 납, 비소, 수은에 대해 각각 평균 0.084 mg/kg, 0.133 mg/kg, 0.0028 mg/kg 농도로 검출되었다. 과·채가공품은 납, 비소, 수은에 대해 각각 평균 0.149 mg/kg, 0.086 mg/kg, 0.0013 mg/kg 농도로 검출되었고, 음료류는 납이 0.131 mg/kg, 캔디류는 수은이 0.0031 mg/kg 농도로 검출되었다. 중금속 기준규격이 있는 음료류 및 캔디류 제품은 모두 기준 이하로 검출되거나 검출되지 않았다. 비소 외에는 기준규격이 없는 제품도 국내 식품의 중금속 기준을 종합하여 비교하면 최대 기준을 넘지 않았으며, 비소의 경우에도 식품의 중금속 연구 결과와 비교하였을 때 비교적 안전한 수준이라고 판단되었다.

P3-13

시중 유통 음료의 알루미늄 섭취 위해평가

최영주, 김범호, 김경아, 김대환, 김지은, 강효정, 민지현, 이명진
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본 연구는 캡슐커피, 캡슐티, 캔음료에 함유된 알루미늄 함량 조사와 알루미늄 섭취에 대한 식품위해평가를 실시하였다. 캡슐커피의 원두 및 추출된 커피 내 알루미늄 함량을 조사한 결과, 원두는 1.9583 mg/kg, 추출된 커피는 0.0131 mg/L의 함량을 가지고 있었다. 또한 캡슐커피머신을 통해 알루미늄 함량이 원두에서 커피로 만들어지면서 0.67% 이행된 것을 확인할 수 있었다. 블렌딩 원두가 오리진 원두보다 알루미늄 함량이 좀 더 많았고, 원두의 품종에 따라서도 아라비카 커피가 카네포라 커피에 비해서 알루미늄 함량이 많았다. 캡슐커피의 추출량별 알루미늄 함량에도 차이가 있어 Alto, Mug, Lungo, Ristretto, Espresso 순으로 높았다. 커피를 내리는 방법별 알루미늄 함량을 비교한 결과, 캡슐커피머신, 알루미늄 모카포트, 도자기 핸드드립, 융 핸드드립 순으로 높았다. 캡슐커피 내 알루미늄 포장재를 사용하는 것이 알루미늄 포장재를 사용하지 않는 것에 비해 약간 더 높은 알루미늄 함량을 가지고 있었다. 캡슐티(허브티, 커피 외) 중에서는 허브티가 알루미늄 함량이 0.0342 mg/L를 가지고 있어 많은 양의 알루미늄을 함유하고 있었다. 캔커피의 경우 보관 온도에 따라 차이가 있었고, 탄산음료와 주류 음료에서도 알루미늄이 함유되어 있었다. 알루미늄에 대한 식품위해평가를 한 결과 음료에 의한 유해영향은 안전한 수준인 것으로 분석되었다.

P3-14

DNA barcode 정보를 이용한 수산물 원재료 진위 판별에 관한 연구

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본 연구에서는 DNA barcode 종 판별 시험법을 이용하여 식품접객업소에서 제공하는 초밥 및 생선회 42개 제품과 식자재마트에서 취급하는 수산물 식재료 20개 제품에 대한

진위판별 동정을 실시하였다. 진위 판별에 사용한 마커 유전자는 미토콘드리아의 16S ribosomal RNA 및 cytochrome c oxidase subunit I 를 이용하였다. 모니터링 결과 식품접객업소 제품 67%는 제품명과 원재료명이 일치했지만, 33%에서는 불일치 한 것으로 나타났다. 특히, 대게살튀김과 홍게다리튀김의 경우 전혀 다른 원재료인 나일틸라피아와 아메리카 대왕오징어로 확인되었다. 오징어는 식품의약품안전처 지정 알러지 유발물질로서, 이번 사례를 통해 알러지 제품이 포함된 허위표시는 건강에도 위험을 초래할 수 있음을 확인할 수 있었다. 식자재마트 제품의 경우 유통업체에서 부착한 라벨명과 원재료와의 불일치율은 35%로 원재료 종류와 비율까지 식품접객업소 제품과 비슷한 경향을 보였다. 이는 식자재마트 제품을 식품접객업소에서 구입, 조리시 식품표시기준 사항을 확인하지 않고 유통점에서 임의로 부착한 제품명을 그대로 사용기 때문으로 판단된다. 이와 같은 식품접객업소에서의 비의도적 식품사기를 막기 위해선 식자재마트의 라벨 관리가 선행되야 할 것으로 생각된다.

P3-15

곡류 및 그 가공식품의 무기비소 오염도 실태 조사

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유통 중인 곡류 87건 및 그 가공식품 66건을 대상으로 발암물질인 무기비소의 오염도를 조사하였다. 높은 분리능과 감도를 가진 HPLC-ICP/MS를 이용하여 무기비소 As(III), As(V) 및 유기비소 MMA, DMA, AsB, AsC를 분석했으며, ICP/MS로 총비소를 정량하였다. 모든 곡류에서 무기비소가 검출되었으며, 곡류의 총비소는 무기비소와 DMA로 대부분 구성되었다. 곡류 분석 결과, 담수재배 종인 쌀과 흑미에서 높았고, 밭 재배 잡곡은 오염도가 낮았다. 쌀의 평균 무기비소 농도는 쌀눈 0.160 mg/kg, 현미 0.135 mg/kg, 백미 0.083 mg/kg으로 외피에 비소가 많은 것으로 조사되었다. 곡류 가공식품은 원재료의 종류와 함량에 따라 무기비소 농도가 달랐으며, 현미와 쌀눈 가공 제품에서 검출량이 높았다. 쌀의 세척 및 침지에 따른 경시 변화 실험 결과, 세척 횟수와 침지 시간이 증가할수록 무기비소가 저감되며, 현미보다 백미의 저감률이 높은 것으로 조사되었다. 모든 시료는 기준규격을 초과하지 않았지만, 섭취 빈도가 높으므로 식품 안전을 위해 지속적인 모니터링이 필요할 것으로 판단된다.

P3-16

국내 농특산자원의 원료 및 가공방법에 따른 비오틴(biotin) 성분 특성

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비오틴은 수용성 비타민(vitamin H)으로 유아의 성장 발육에 필수적인 영양성분이며, 최근 건강, 미용, 모발 등 뷰티향장산업에 대한 트랜드 변화로 비오틴 소재원 발굴도 필요한 시점이다. 국내에서 생산되고 가공되는 농특산자원의 급속히 증가하고, 영양성분 데이터의 자급률을 높이고자 비오틴 자원 발굴 및 국가표준식품성분표의 지속적인 개정에 분석 데이터을 제공하기 위하여 비오틴 성분특성 및 DB 구축을 추진하고 있다. 분석 데이터의 신뢰도 향상 및 신속성이 요구되면서 선택성과 특이성이 뛰어난 LC-MS/MS를 이용한 비오틴 분석법을 정립하여 농특산자원의 원료 특성 및 가공방법에 따른 비오틴 함량을 분석하였다. 농특산자원에서 비오틴 함량은 다른 영양성분보다 낮은 경향이었으며, 가공방법보다는 원료 특성에 따른 함량 차이가 크게 나타났다. 원료가 같은 농특산자원이라도 가공 및 조리방법을 달리하였을 때에 함량이 다르다는 특성을 보였다.

P3-17

제주지역 밭 토양 중 잔류농약 모니터링

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농업환경 보전과 안전 농산물 생산을 위한 예방 위주 안전성 관리 방안을 마련하고자 농업환경 중 잔류농약 변동조사를 추진하고 있다. 농약은 국민의 안전 및 건강에 직접적으로 관련되므로 먹거리를 생산하는 농업환경에서의 화학농약으로부터 안전성 확보을 위하여 농경지 중 잔류실태 파악으로 비의도적 오염 가능성 예측, 후작물에의 잔류 우려 등에 대한 사전 안전관리 대책이 필요한 실정이다. 분석 데이터의 신뢰도 향상과 신속 분석을 위하여 LC-MS/MS를 이용하여 다성분 동시분석법을 정립하고, QuEChERS법으로 추출, 정제하여 토양에 잔류하는 농약성분을 분석하였다. 2021년도에는 제주지역 밭 토양 26지점을 대상으로 잔류농약을 모니터링하였다. 모니터링한 결과, 분석대상 농약 160성분 중 23종이 검출되었고, 잔류량은 0.001~0.41mg/kg 범위였다. 밭 토양에 잔류하는 안전성 우려 농약 성분 중 다빈도로 검출되는 농약은 Acephate, Carbendazim, Chlorantraniliprole, Metolachlor, Pendimethalin, Tebupirimfos 등이었고, 잔류농도가 높은 성분은 Pendimethalin, Metolachlor, Hexaconazole, Tebuprimfos, Imicyafos 등이었다.

P3-18

Physicochemical characteristics of yellow ball, a new citrus variety

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Citrus fruits are consumed globally, and various varieties are being developed to improve their quality. However, their shelf life is short. Yellow ball (*C. hybrid cv.* Yellow ball) is a new citrus variety hybridized with Haruka (*C. tamurana* × *natsudaidai*) and Kiyomi (*C. unshiu* × *sinensis*), and was developed to improve quality and storage. However, its characteristics were not evaluated. In this study, the physicochemical characteristics of the Yellow ball were investigated and compared to its parent citrus (Haruka and Kiyomi). The storage of the Yellow ball was longer than its parents because of its low water transmission rate, the small size of the stoma, and the tight internal structure. In addition, many metabolite profiles of the Yellow ball were significantly different from its parents, especially, secondary metabolites, resulting in the taste difference. Although the functional properties of the metabolites were not evaluated, these results indicated that the Yellow ball had better quality characteristics including storage and taste than other citrus varieties.

P3-19

Determination of cyanogenic glycosides in home-made maesil-cheong from korea by LC-MS/MS

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Amygdalin is the major cyanogenic glycoside found in Korean green plums, Maesil (*Prunus mume*). Amygdalin is not toxic until it is metabolized to toxic hydrocyanic acid by digestive enzymes. In this study, we determined amygdalin and prunasin contents in home-made Maesil-cheong in Korea by using a high performance liquid chromatography system interfaced to a triple-quadrupole tandem mass spectrometer. The analysis method was validated using

lemon-cheong (i.e., lemon syrup), absent in amygdalin and prunasin content. The analysis method validation result showed good linearity (R2 over 0.999) with a wide linear range of 5-200 mg/kg, low method detection limit, and low method quantitation limit. Intra-day (n=5) and inter-day (3 days, n =15) accuracy and precision results met the Codex guideline. The validated method was applied to determine amygdalin and prunacin content in home-made Maesil-cheong and the data will be shown.

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P3-20

Comparison of nutrient compounds of processed products using truffle

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The fungi include yeast, filamentous fungi, mushroom ,among them, mushroom were well known for blood pressure control and cholesterol lowering effect. Among those, truffles are fungi that produce their fruiting body in an underground and there are produced in the soil or leaf litter in a symbiotic mycorrhizal association with plants. Also, truffles are the one of the famous and expensive edible hypogeous macrofungi whose price can reach one to two thousand dollars per kilogram like *Tuber magnatum*(the white Piedmont truffle) and *Tuber melanosporum*(the black Périgord truffle). Nowadays, the production of Chinese truffles(*Tuber indicum*) is increasing in Asia and the new species was discovered in Korea. Truffle fruiting bodies were considered a food delicacy, mostly due to their unique aromas.

In this study, we performed to figured out of nutrient compounds in truffles and related products, the results showed the nutrient compounds contents of truffle and related products which 4 kinds of minerals, vitamin C, ergosterol, and β-glucan.

As a result, vitamin C, ergosterol, and β-glucan contents were showed the highest contents in truffle. Also vitamin C and β-glucan contents of black

truffle slice and white truffle slice were showed similar contents. And also, truffle mayonnaise and truffle mustard were showed similar contents in vitamin C and β-glucan. This results can be provide information to select a processed products of truffle.

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포스터 발표 논문 초록 PART Ⅳ

미생물/발효/안전성 분야

POSTER NO. P4-1~P4-66

P4-1

Fermentative and functional properties of non-*Saccharomyces cerevisiae* isolated from traditional yeast

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In this study, the alcohol production capacity and functional characteristics of five non-Saccharomyces cerevisiae strains of K. marxianus KJ-L, W. aomalus KJ-1, W. anomalus CP-2, P. anomalus HAN-1 and M were evaluated. . Guilliermondii SU-L isolated from Korean traditional yeast. The selected yeast strain showed high alcohol production capacity at a carbon source of 20% glucose and was identified as non-Saccharomyces cerevisiae (NSC) based on the 18S rDNA sequence. and pH were determined at 25 ˚C and 4.0, respectively. Both NSC strains (KJ-L and CP-2) produced 5-10% more alcohol than the control S. cerevisiae LP (SC LP). The activities of α-amylase and β-glucosidase were slightly lower in NSC strain than SC LP, but glucoamylase showed 1.4-fold higher activity in NSC strain than SC LP. K. marxianus KJ-L and P. anomalus HAN-1 had 29-fold higher α-glucosidase inhibitory activity than S. cerevisiae LP. Five strains of NSC showed higher ACE inhibitory activity with an inhibition rate of 51.7%-61.7% compared to SC LP (37.3%). The tyrosinase inhibitory activity of NSC (86.4-91.5%) and SC LP (94.9%) was significantly superior to that of the positive control, kojic acid. The selected NSC yeast is expected to have high industrial application value as a starter for domestic fermented food and cosmetics manufacturing in the future by using excellent physiological activity and various functional properties.

P4-2

소규모 새싹보리 분말류 가공업체용 디지털 해썹 관리시스템

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식품안전 향상을 위한 해썹은 적용 품목과 대상이 확대되어, 종업원 5인 이하 소규모 업체도 의무적으로 해썹 인증을 받아야만 한다. 소규모 새싹보리 분말류 가공업체는 복잡한 준비 과정과 사후 관리로 노력이 많이 소요되는 해썹 인증 및 운영에 큰 어려움을 겪고 있다. 본 연구는 소규모 새싹보리 분말류 가공업체의 해썹 관리 노력을 줄여줄 수 있는 디지털 해썹 관리시스템을 설계하기 위하여 수행되었다. 관리시스템의 주요 기능은 해썹

인증 신청을 위한 구비서류 입력 자동화와 인증 후 중요관리점 모니터링 같은 디지털 관리로 이루어진다. 구비서류 입력 자동화는 한국식품안전관리인증원에서 발행한 소규모 사업체의 차류(새싹보리 분말류 포함) 해썹 표준기준서를 표준양식으로 사용하여 해당 업체의 특성에 맞게 수정할 수 있도록 한다. 건조기 온도, 금속검출봉 자력 같은 중요관리점 모니터링은 계측값을 수동으로 측정하거나 센서로부터 자동 측정된 값을 데이터베이스를 활용하여 실시간으로 제공한다. 구현된 새싹보리 분말류 디지털 해썹 관리시스템은 업체 특성에 따라 냉장실 온도 등을 중요관리점으로 설정할 수 있다. 주요 센서 측정값과 점검사항 입력 데이터는 휴대용 기기에 설치된 관리시스템의 메인 화면에 표시되며, 한계 기준 이탈 시 이에 대한 조치 사항도 작성할 수 있다. 이들 결과는 휴대용 기기에서 열람할 수 있고, 해썹팀에서는 이들 기기를 이용하여 일지 작성, 열람, 상신하면 검토자가 검토 및 결재를 통해 최종 문서를 생성할 수 있다.

P4-3

백합추출발효분말을 이용한 곡류효소의 제조

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보타노스

백합(*Lilium longiforum* Thunb.)은 구성성분과 약리효과로 인하여 약용으로 사용되어 왔으며, 국수, 쿠키, 통조림, 발효주 등 다양한 식품에도 이용되어왔다. 백합구근에 들어있는 페놀성분은 *p*-coumaric acid, ferulic acid 등으로 확인된 바 있으며, *p*-coumaric acid는 항균작용과 항산화효과가 있는 것으로 보고되었고, ferulic acid는 정상세포에는 무독한 반면 암세포는 강한 독성을 보인다고 보고된 바 있다. 건강기능식품 제조 시 천연식품 소재의 생리활성을 증가시키기 위해 가열, 발효 등 다양한 가공방법이 사용된다. 본 연구에서는 백합구근을 열수추출한 후 발효공정을 도입하여 제조한 백합추출발효분말을 이용하여 곡류효소식품을 제조하였다. 곡류효소식품은 식물성 원료에 식용 미생물을 배양시켜 효소를 다량 함유하게 하여 섭취가 용이하도록 가공한 것이다. 메밀, 서목태, 수수, 율무를 증자하여 백합추출발효분말 혼합하고 *Aspergillus oryzae*를 접종하였으며, 25℃에서 48시간 동안 배양하여 곡류효소를 제조한 후 식품의 *p*-coumaric acid 및 ferulic acid 함량, DPPH 소거능, 금속이온촉매 산화억제효과(단백질보호능), nitric oxide소거능 등을 분석하여 곡류효소식품의 항산화활성을 확인하였으며, 곡류효소식품의 영양성분 및 안전성을 확인하였다.

P4-4

Analysis of metagenome and sensory characteristics from korea traditional vinegars

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Acetic acid fermentation (AAF) for production of traditional vinegar is a spontaneous and complex process of various microorganism, and it is directly related to improving the quality of the final product that understanding the dynamics of microorganism in AAF. In this study, physicochemical and sensory characteristics of seven traditional vinegar collected from Korea were analyzed and interpreted from a microbiological point of view by linking them with the results of metagenome analysis. HPLC analysis showed that the main organic acids of the seven grain vinegars were acetic acid as 91.4%. *Acetobacter ghanensis* and *Lactobacillus acetotolerans* were detected as dominant species in metagenome analysis using Illumina 16S Metagenomic sequencing. Among the vinegars, JBG_BR and JBG2_UR fermented in the open field exhibited significantly higher intensity of sourness compared to other vinegars in evaluation of taste fingerprint using electronic tongue. In the PICRUSt2 analysis for prediction of the function of microbial community, JBG_BR and JBG2_UR were clustered and showed similar function. According to the distance matrix, GN_UR fermented at 30℃ was 4.62 fold as far from JBG_BR as was JBG2_BR, especially. Therefore, it was suggested that fermentation temperature of traditional vinegar affects not only microbial community but also the quality of the products such as sensory characteristics.

P4-5

Quality characteristic of fermented vinegar using *Maclura tricuspidata* fruits and identified of ingredients by UPLC/QTOF-MS

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Maclura tricuspidata has been used as an important traditional herbal medicine due to its medicinal properties and its fruit is being used to make

fresh juice, jam and wine in Korea. Previous studies have reported the presence of various bioactive components with sweet taste and unique flavor in the fruit. This study was performed to produce *M. tricuspidata* fermented vinegars (MTFV) of regular acidity (6-8%, MTFV-1) and high acidity (10-12%, MTFV-2) using and physicochemical properties, phenolics and antioxidant activities of MTFV were compared with those of brewing vinegars (BV). In addition, 65 of components were tentatively identified by analyzing with UPLC-QTOF-MS. The MTFV-2 was found to have higher acetic acid concentration (9394.5±174.7 mg/100mL) and free amino acid content (550±5.6 mg/100mL). Particularly, The contents of total phenol (426.3±18.1 mg/100mL) and total flavonoid (187±16 mg/100mL) were higher in MTFV-2. Chlorogenic acid, caffeic acid and three 4-hydroxybenzyl alcohol derivatives were only detected in the MTFV. Similarly, the antioxidant capacity was relatively higher in MTFV than BV products. The higher nutritional and functional properties are suggested to attributed to the higher contents of the bioactive compounds in the *M. tricuspidata* fruit compared to the materials used in the commercial vinegars. The results suggested that MTFV have a potentials as a health food materials.

P4-6

Microbial Characterization of Useful Fungi Isolated from Commercial *Nuruk*

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Various fungi were isolated from 6 types of commercial *Nuruk.* The isolated fungi were identified using 18S, 26S rRNA and ITS sequencing. For growth characteristics of fungi, various pH (3, 5, 7, 9) and temperature (5, 15, 28, 30, 45, 55℃) conditions were set individually, and the optimum growth conditions were investigated. Subsequently, the enzyme activity and safety characteristics and functional characteristics were analyzed.

As a result, 12 kinds of fungi were identified, and it was found that they grow excellently under the conditions of almost pH 5-7 and 28-35℃. Based on the results of glucoamylase activity and the non-detection of mycotoxins (aflatoxin and ochratoxin), 5 species (*Lichtheimia corymbifera* SY_WF, *Rhizomucor pusillus* JT_B, *Lichtheimia corymbifera* BK_WF, *Rhizopus oryzae*

CP_BF, *Aspegillus oryzae* YS_Y) were selected, and then resistance to 9 kinds of antibiotics was identified. In addition, as a result of the antidiabetic activity using acarbose (5 mg/mL) as a standard substance, it was shown that A. oryzae YS_Y was relatively high activity at 43.8%. Antibacterial activity against of 4 pathogens, it was shown that fungi had against to *E. coli, Staphylococcus aureus,* and *Salmonella typhimurium* except for *Bacillus cereus.*

P4-7

Hygienic effect of MA (Modified Atmosphere) film on ginseng sprout packaging

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Ginseng sprout is a fresh vegetable which is consumed as a whole plant within 1-2 weeks after harvest. When packaging ginseng sprouts, many farms use moss to avoid drying and to give fresh appearance. To evaluate microbiological safety of the moss, we compared the moss and MA (modified atmosphere) film developed for ginseng. The ginseng sprout samples were wrapped with either the moss or the MA film and stored at 4℃ for 7 days. At 5 times (0, 1, 3, 5 and 7th day), the number of total fungi, total aerobic bacteria, relative humidity and moisture content of the samples were measured. The number of total fungi and total aerobic bacteria of all the samples tended to increase for 7 days. At 7th day, both total fungi (3.98 log cfu/g) and total aerobic bacteria (7.32 log cfu/g) of the sample in the MA film packaging were significantly lower than those of the sample in the moss (4.61 log cfu/g, 7.63 log cfu/g, respectively). There was no significant difference in the relative humidity and moisture content of the samples by packaging conditions. This result shows that hygiene of ginseng sprout can be improved by using the MA film instead of moss for packaging.

P4-8

Effect of sterilization conditions on microbial reduction in cleaning tools

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In this study, we conducted drying, hot water, and microwave sterilization for comparing an effect of microbial reduction in scourers and dishcloths, and then suggested a suitable sterilization method. The scourers were used for three types of silver, copper, and mesh types, and the dishcloths were used for three types of silver, bamboo, and cotton. The reduction effect of coliform bacteria according to the drying time was high in silver and copper scourers, but *Bacillus cereus* was minimal reduction effect in scourers. In scourers, coliform bacteria were not detected at 77℃ for more than 30 seconds of hot water sterilization, and *B. cereus* was not detected at 100℃ for more than 60 seconds of hot water sterilization. In dishcloths, coliform bacteria were not detected after hot water sterilization at 77℃ for more than 30 seconds, but *B. cereus* was detected after hot water sterilization at 100℃ for more than 60 seconds. In scourers, coliform bacteria were not detected after microwave sterilization with 700 W for 3 minutes, but *B. cereus* was detected. In dishcloths, coliform bacteria were not detected after microwave sterilization with 700 W for more than 1 minute, but *B. cereus* was detected in the cotton dishcloth even after sterilization for 3 minutes. Therefor we suggest that the effective method of hygiene management is submerging scourers in hot water at 100℃ for more than 1 minute, and dishcloths for more than 3 minutes sterilization using a 700 W microwave.

P4-9

Functional characteristics of acetic acid bacteria isolated from farm-made fermented vinegar

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The present study evaluated the functional characteristics of six strains of acetic acid bacteria (AAB), namely, KSO 5, JGB 20-11, JGB 21-17, JGB21-20, GHA 7, and GHA 20, which were isolated from farm-made fermented vinegar. *Staphylococcus aureus* presented high susceptibility to the antibacterial activity

of the six strains of AAB. The antioxidant activity evaluated using DPPH and ABTS was 2 fold and 4 fold higher for the six strains of AAB than that for the control group, respectively. KSO 5 strain exhibited higher ACE activities, with inhibition rates of 91.3%, as compared to those exhibited by the positive control of 0.1% captopril (inhibition rate of 76.9%). Furthermore, the fibrinolysis activities of six AAB were more than 80% compared to 0.5 U plasmin. Four bacterial strains (except for 98.3% of JGB 21-17 and GHA 7), exhibited α -glucosidase inhibition activities of 100%. It was concluded that the six strains of AAB exhibited excellent physiologically active characteristics, which facilitated their use as seed strains for the synthesis of high-efficiency functional vinegar by harnessing the functional characteristics that fit the scientific basis.

P4-10

양파착즙액 발효물 첨가에 따른 한식간장의 품질특성 및 항산화활성

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한식간장은 발효·숙성과정에서 다양한 미생물에 의해 생성된 독특한 향미 등으로 기호도가 낮아 대부분 일본식 간장이 소비되고 있는 실정이다. 본 연구는 한식간장의 기호도 및 기능성 증진을 위해 염수 대신 양파착즙액(OE)과 발효물(OF)을 각각 70%와 100%를 첨가한 간장의 품질특성을 확인하였으며, 발효물 제조를 위한 균주는 사전실험을 통해 선정된 *B.breve* KCTC 3441을 이용하였다. pH, 적정산도, 당도, 색도 및 환원당은 첨가량과 발효기간에 따른 변화를 나타내었다. 식염 함량은 OF-100% 첨가 시료구가 18.80%로 가장 낮은 함량을 나타내었으며 총균수와 유산균수는 OF-70% 첨가 시료구가 각각 10.19와 9.64 log CFU/mL로 가장 많은 균수를 나타내었다. 총 폴리페놀과 총 플라보노이드 함량은 OF-100% 첨가 시료구가 각각 585.46 mg/100 g과 100.25 mg/100 g으로 가장 높은 함량을 나타내었고 항산화 활성 또한 OF-100% 첨가 시료구가 가장 높은 활성을 나타내었다. 관능평가 결과 OF-100% 첨가 시료구가 모든 항목에서 가장 높은 기호도를 보여주었다. 따라서 한식간장의 기호도와 기능성 증진을 위해 양파착즙액 발효물 100% 첨가가 적합할 것으로 판단된다.

P4-11

Fermentation of onion extract by lactic acid bacteria enhances its physicochemical properties

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This study reviewed the quality characteristics resulting from various fermentation methods to select a suitable strain of lactic acid bacteria for extracting onion flesh and skin and fermenting its juice. The pH of the fermented onion extract decreased upon fermentation by lactic acid bacteria. The titratable acidity increased, and the cell counts of the lactic acid bacteria increased up to 48 hours after fermentation commenced and then decreased. The total free sugar content decreased in all samples. The total organic acid content increased with fermentation, with lactic acid showing the highest increase. The quercetin content increased upon fermentation in the *B. breve* KCTC 3441, *E. faecalis* KCTC 3206, *L. bulgaricus* KCTC 3635, and *S. thermophilus* KCTC 3782 inoculated samples.

P4-12

Comparison of the quality characteristics by part of sprouted garlic

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This study compared the quality of garlic produced in conventional cultivation and sprouted garlic grown in smart farm facilities. The quality of sprouted garlic was compared by each part (garlic, stem, and root). Regarding moisture and crude fat, the stem showed the highest values at 7.56 and 2.39%. On the other hand, the root showed the highest crude ash and crude protein values at 12.30 and 45.35%. After measuring the polyphenol and flavonoid content of sprouted garlic and control (general garlic), the polyphenol content was higher in the sprouted garlic than in the control, and there was no significant difference in the flavonoid content. The DPPH free radical activity was twice as high in the whole area (62.21%) of sprouted garlic than in the control (30.16%).

The ABTS radical activity and SOD-like activity were also higher in the whole area of sprouted garlic than in the control group. The organic acid content was the highest in the stems, with a total organic acid content of 1,559.11 mg%.

P4-13

유청을 활용하여 바이오 에탄올 생산 기술 개발

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치즈 생산 시 발생되는 부산물인 유청은 대부분 폐기 처리하며 폐기 과정에서 환경오염 문제가 발생한다. 이러한 환경오염 문제 해결 및 유청의 활용도 증진을 도모하고자 유청에 포함되어 있는 유당을 알코올로 전환하기 위한 최적 발효 균주 선발 및 발효 기간 선정을 통해 신재생에너지인 바이오 에탄올 제조 조건을 확립하고자 하였다. 최적 발효 균주 선발은 유청을 기질로 하여 총 4가지 균주(*K. lactis* KCCM 11287, *P. anomala* KCCM 11473, *K. lactis* KCCM 50735, *K. fragilis* KCTC 7260)의 유당분해능과 에탄올 생성능을 검토한 결과 *K. lactis* KCCM 11287, *K. fragilis* KCTC 7260으로 선정하였다. 선발 균주의 발효 기간에 따른 특성은 10일 간격으로 분석하였으며 발효 20일차 알코올 함량은 *K. lactis* KCCM 11287과 *K. fragilis* KCTC 7260이 각각 2.60%와 2.37%로 나타났다. 이후 유의적인 차이를 보이지 않아 최적 발효 기간은 20일로 선정하였다. 연구 결과를 바탕으로 2017년 기준 유청 생산량은 약 35만톤가량이 생산되는데 이를 알코올 발효 및 증류를 통해 순도 95% 내외의 바이오 에탄올을 약 92백톤을 생산할 수 있을 것으로 추정된다.

P4-14

Microbial isolation step 1 for the development of kombucha scoby

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In this study, the bacteria required to develop kombucha scoby were isolated and identified from fermented foods. The separation source used vinegar and kombucha stored in the laboratory. After confirming the characteristics, nine pure colonies were isolated. Nucleotide sequencing of eight colonies isolated from vinegar and one colony isolated from Kombucha revealed eight types of

Acetobacter pasteurianus and one type of *Lacticaseibacillus paracasei.* The isolated *Acetobacter pasteurianus* strains were called SVC-04, 12, 14, 22, 38, 49, 410, and 54. The *Lacticaseibacillus paracasei* strain was called SKA-2. *Kombucha* was prepared by adding 1% of each strain culture solution and sugar to the green tea extract to confirm the fermentation ability of the nine strains. Bacteria with excellent fermentability were finally selected through fermentation at 30°C for 20 days.

P4-15

Comparison of the antioxidant activity according to ethanol extraction concentration of omija

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This study compared the antioxidant activity of extracts according to the ethanol concentration (0%, 30%, 50%, 70%, and 100%) of omija. The total polyphenol and flavonoid contents were 41.67 mg/100g - 80.27 mg/100g and 11.71 mg/100g - 58.94 mg/100g, respectively, indicating an increase with increasing ethanol concentration. In the case of the antioxidant activity, the DPPH radical scavenging activity of 81.04%, ABTS radical scavenging activity of 77.02%, and SOD-like activity of 41.15%, 94.5% ethanol extract showed the highest activity in all items. Therefore, a comparison of the total polyphenols, total flavonoids, and antioxidant activity showed that 94.5% ethanol was suitable as the extraction solvent for the preparation of omija extract.

P4-16

브로콜리 및 아스파라거스에 대한 각국의 잔류농약 모니터링

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본 연구에서는 각 국가에서 수입되는 식품 중 브로콜리와 아스파라거스의 원산지에 따른 검출 농약을 조사하여 대한민국의 수입 브로콜리 및 아스파라거스에 대한 잔류농약 안전 관리 자료로 활용하고자 한다. 2014-2021년 EU, 대만, 미국, 영국, 일본, 및 중국에서 수행된 잔류농약 검사 결과를 수집하여 브로콜리와 아스파라거스에 검출된 농약, 검사 건

수, 검출 건수 및 검출량을 정리하였다. 브로콜리의 잔류농약 검사건수는 103,164건이었으며, 그중 3,168건에서 잔류농약이 검출되었다. 검출된 농약은 2,6-DIPN, abamectin, acephate 등 129종이 검출되었다. 그중 thiamethoxam이 검사건수 2,713건 중 391건(0-0.065 mg/kg)으로 가장 많이 검출되었으며, 검출량은 propamocarb 농약이 16 mg/kg으로 가장 높게 나타났다. 브로콜리의 원산지별 농약 검출건수는 미국산 2,138건(0-1.5 mg/kg), 멕시코산 388건(0-2.6 mg/kg), 스페인산 149건(0.01-12 mg/kg)이 가장 많이 검출되었다. 아스파라거스의 잔류농약 검사 건수는 20,121건이었으며 그중 450건에서 잔류농약이 검출되었다. 검출된 농약은 67종이며, abamectin, acephate, acetamiprid 등이 검출되었다. 그중 chlorpyrifos가 검사건수 1,837건 중 107건(0-1.39 mg/kg)으로 가장 많이 검출되었다. 검출량은 carbaryl (NAC) 농약이 3.4 mg/kg으로 가장 높았다. 아스파라거스의 원산지별 농약 검출건수는 페루산 174건(0-1.8 mg/kg), 미상 70건(0.002-0.36 mg/kg), 멕시코산 63건(0-1.92 mg/kg)이 가장 많이 검출되었다.

P4-17

UV-C 조사 선량에 따른 신선편이(fresh-cut) 수박의 품질특성

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가열처리가 곤란한 신선편이 제품의 미생물학적 안전성 확보를 위해 irradiation, electrolyzed oxidaizing water, organic acid, ozone, chlorine, sodium hypochlorite 등과 같은 다양한 비가열처리 방법이 사용된다. Ultraviolet(UV)는 파장 100~400nm 범위의 전자기파로 살균 및 소독에 사용되는 것은 주로 UV-C(100~280 nm)이며, 식품 표면의 미생물학적 오염을 줄이는데 이용된다. 240~260 nm 범위의 UV-C 광선은 표면 살균처리로 식품에 사용하도록 미국에서 승인이되었다. 특히 253.7 nm 파장의 UV-C는 미생물의 DNA base에 손상을 일으켜 미생물을 사멸시키는 것으로 알려져 있다. 반면 UV-C는 일부 화합물의 농도에 영향을 미칠수 있으며, 변색을 유발하는 산화적 변화를 촉매한다는 보고가 있다. 신선편이 수박의 비가열 살균 방법으로 UV-C 조사를 적용하기 위해 본 시험을 수행하였다. 씨 없는 수박을 큐브(2.5*2.5*2.5cm) 모양으로 절단 후 1회 용기에 6조각씩 담아 클린벤치 안에서 대장균(7 log cfu/g)을 각 조각 마다 100ul 씩 접종하였다. UV-C 선량을 0, 2, 4, 8, 14, 20 KJ/m2으로 달리하여 수박에 조사하였다. 이후 필름으로 밀봉 포장 후 4℃ 냉장고 안에 보관하면서 24시간 이내에 품질특성을 조사하였다. pH, 당도, 경도는 처리 선량별로 유의적 차이를 보이지 않았고, 총 폴리페놀 함량은 대조에 비해 다소 감소하였다. 대장균 수는 대조에서 7 log cfu/g 이었는데, UV-C 8, 20 KJ/m^2 처리에서는 6 log cfu/g로 감소하였다. 라이코펜 함량은 대조(28.53 mg/g)에 비해 2 KJ/m^2(31.64 mg/g), 4 KJ/m^2(30.89 mg/g) 조사 처리에서 증가하였다. 아르기닌 함량은 0~14 KJ/m^2 까지는 유의한 차이를 보이지 않았고 20 KJ/m^2에서 유의적으로 감소하였다.

UV-C 조사는 신선편이 수박의 전반적인 품질 유지를 위한 유용한 방법이라고 판단되며, 신선편이 수박에 적정한 UV-C 조사량에 대해서는 추가 연구가 필요하다.

P4-18

Characteristics and shelf-life of *Oryza sativa* L. using stabilization-drying process

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Oryza sativa L. (Rice) is one of the main staple crops especially in South Korea. Rice production is consistently stable for over decades, but rice consumption has been gradually decreased in Korea, which causes rapid stockpile in rice inventory. Therefore, the innovative development of rice processing is on demand to increase consumption and shelf-life of rice. In this study, we established Stabilization-drying (SD) process and examined whether this SD process improved storability and functionality. We analysed moisture content, acidity, bacterial counts and fungal toxins for storability and contents of resistant starch, octacosanol, â-sitosterol, campesterol, stigmasterol for functionality of white rice (WR), brown rice (BR) and rice gum (RG) according to different storage duration. Rice was conducted by SD process [cold-hot cycle (40-85˚C), 60 rpm rotation, irradiation of far infrared and ultraviolet rays for 18 min-drying in closed chamber] with moisture, odor, and impurities exhaust system, followed by air-drying for 12 hr. SD process decreased moisture content, acidity and bacterial counts up to 90-day duration, maintained the level of fungal toxins and stabilized the bioactive components in all types of rice. In conclusion, SD process is considered to facilitate effective storage of rice and promote rice consumption by increasing shelf-life and functional components.

P4-19

곤드레가 포함된 양념을 첨가한 김치의 품질특성

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김치는 주원료인 절임 배추에 고춧가루, 마늘, 생강 및 파 등의 여러 양념류와 젓갈류를 혼합하여 저온에서 주로 유산균에 의해 발효시키는 전통발효식품이다. 곤드레는 다년생 야

생 초본으로 페놀성 화합물을 포함하고 있어 항산화력이 우수하고 그 외 알코올성 간경화 예방 및 지질의 산화 예방에도 우수한 것으로 알려져 있다. 이와 같이 기능성이 우수한 곤드레를 김치의 양념 중에 첨가하여 제조한 김치의 품질을 조사하였다. 배추와 무를 제외한 15%(w/w) 양념류에 20%(w/w)의 곤드레를 김치 제조에 첨가하여 곤드레를 첨가하지 않는 대조구와 일반성분 및 미생물 분석 등을 비교하였다. 곤드레 양념이 첨가된 김치와 일반 김치의 Ca, K, Na, Mg 등의 무기질을 분석한 결과 Ca과 Na의 양은 약간 증가한 반면 K과 Mg은 반대로 약간 감소한 면을 보이고 있었다. 또한 위암과 대장암주에 대한 항암시험 결과 항암효과는 없는 것으로 나타났으며 항산화력은 곤드레 양념을 첨가하지 않은 대조구에 비해 약간 증가하고 있는 것으로 나타났다. 배추와 곤드레를 절이는 염농도를 14, 15, 16 및 17%(w/w)로 달리하여 제조한 곤드레 양념을 첨가한 김치를 4℃에 30일간 저장하면서 pH, 적정산도, 환원당, 생균수 및 유산균수를 측정한 결과 염농도에 따른 유의할 만한 차이나 변화를 볼 수 없었다. 또한 삶은 곤드레를 20, 40 및 50%(w/w)를 첨가한 양념을 김치 제조 중에 첨가하여 관능검사를 실시한 결과 맛, 조직감 및 전체적인 기호도에서는 5% 수준에서 시료간의 유의적인 차이를 볼 수 없었으나 색에서는 5% 수준에서 유의적인 차이를 보이고 있었다. 즉 곤드레 첨가량이 많을수록 관능적인 기호도가 낮아지고 있었다.

P4-20

Physical properties of soybean meal protein isolates prepared from defatted soybean meal

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Soybean meals are mainly discarded, but since they contain proteins and amino acids, they can be used as functional food materials. Therefore, in this study, we fermented skimmed soybean powder, defatted soybean meal and isolated soy protein at 55℃ for 48 hours using the Bacillus licheniformis SF5-1 strain. Examination of the general characteristics revealed that the protein content and pH from isolated soy protein was significantly higher than those of the other. The water absorption capacity and oil absorption capacity were high for isolated soy protein, whereas the apparent density and watewr soluble index were high soybean powder. The protein solubility showed minimum at pH 4.0 and increased at pH higher of lower than pH 4.0. The DPPH Radical Scavenging activity was measured highest in the defatted soybean meal. However, ABTS Radical Scavenging activity was measured highest in isolated soy protein. As a result of the above, it was confirmed that the extract obtained by fermenting

isolated soy protein using microbial exhibited a higher physiologica and Physical function

P4-21

Analysis and comparison of microbiome in three types of laver (raw laver, dried laver and seasoned/roasted laver)

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Jeollanam-do is a major laver (*Pyropia* spp., seaweed) producing in South Korea. In recent years, laver production has also increased sharply due to increased domestic demand and of laver exports. However, Microbiological research on laver has not been focused and microbiome in laver still not well understood. The purpose of this study is to understand and microbiome between raw laver, dried laver, and seasoned/roasted laver. A total of 25 laver samples (12 samples of raw laver, 8 samples of dried laver, and 5 samples of seasoned /roasted laver) were collected and subjected for microbiome analysis Jeollanam-do in, South Korea. Genomic DNAs of bacteria were extracted and the amplified V3-V4 regions of the bacterial 16S rRNA gene was subjected for the analysis of microbiome in three types of laver. Analysis of bacterial compositions in raw, dried and seasoned/roasted laver revealed that 80 - 301 OTUs were present in laver. And major class level in dried and seasoned/roasted laver were *Flavobacteria Bacilli Gammaproteobacteria.* Heat map analysis revealed the difference of microbial communities between dried, seasoned/roasted laver and raw laver. Thees results implied that microbial communities were shifted from raw laver to dried, seasoned/roasted laver due to the environmental changes in laver processing.

P4-22

Morphological and physiological charateristics of UV-C irradiated bacteria in drinking water using a water purifier

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The consumption of harmful microbial-free water is a very important factor in maintaining food safety and public hygiene. Therefore, ultraviolet-C (UV-C) irradiation has been an attractive means to safely and efficiently disinfect drinking water without adversely affect on humans. The sterilization rate of *Shigella flexneri* and *Listeria monocytogenes* was evaluated through filtering and UV-C irradiation using a water purifier. Then, morphological and physiological characteristics of microorganisms were observed. The sterilization effect of UV-C irradiation was evaluated by adding UV-C to a water purifier with a field in which both bacteria were artificially inoculated at various concentrations with flow velocity of 3.4 L/min. For morphological studies, it was observed that both bacteria were sterilized by UV-C irradiation using a fluorescence microscope. Additionally, UV-C irradiated of both bacterial (10^8 CFU/mL) were monitored from 0 h to 24 h using fluorescence microscopy and flow cytometry to measure bacterial characteristics over time. UV-C irradiation in the water purifier can effectively remove high concentrations of gram-negative bacteria and gram-positive bacteria in drinking water. It is considered that adding a UV-C sterilizer to the water purifier is effective for the microbial safety of the water.

P4-23

Combinatorial effect of slightly acidic electrolyzed water and sodium benzoate against multi-species oral cariogenic biofilm

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Oral cariogenic biofilm creates highly acidic microenvironments that can promote dental caries progression. *Streptococcus mutans* (*S. mutans*) and *Candida albicans* (*C. albicans*) have been reported that contribute with the

pathogenesis of dental caries. Other bacterial species may also be responsible for caries development. The objective of this study was to evaluate the role of *S. mutans* and *C. albicans* in multi-species cariogenic biofilms. Slightly acidic electrolyzed water (SAEW) combined with sodium benzoate (NaB) was used to control the cariogenic biofilm. In this study, the role of five specific microbes in dental biofilms and their cariogenic properties were observed. The results demonstrated that the presence of *S. mutans* in the multi-species biofilm significant enhanced their cariogenicity. AFM analysis showed that the surface roughness of hydroxyapatite was increased by multi-species biofilm contains *S. mutans* and *C. albicans.* According to SEM image, the extracellular secretion of the biofilm decreased significantly after SAEW+NaB treatment. (SAEW+NaB) could be a potential methods to control human dental caries.

P4-24

Unveiling the potentials of bioactive oligosaccharide1-kestose (GF2) from *Musa paradisiaca Linn* peel with an anxiolytic effect based on gut microbiota modulation in stressed mice model

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Prebiotics, indigestible oligosaccharides found primarily in plant biproduct, aided probiotic development. Banana peels were used as cereal by-products in this study. The possibility of using them as an antistress prebiotics efficacy was examined through in-vitro and in-vivo analysis. Fructo-oligosaccharides (1-kestose (GF2)) in Bannan peel oligosaccharide enzymatic extract (BPOE) were purified, further prebiotic effectiveness was analyzed, and the anti-stress effect was compared in mice. In addition, *Caenorhabditis elegans* and fibroblasts cell line on prebiotic efficacy and cytotoxicity was determined. As a result of enzymatic treatment, kestose (GF2) was quantified using HPLC-RID, HSCC Chromatography at 24.9 mg/g, and COZY confirmed the structural. Further, the oligosaccharide-enriched cookies enhanced the growth of *Lactobacillus rhamnosus.* Additionally, the in-vivo result indicates that the kestose fed mice reduced the stress and significantly decreased corticosterone levels, mainly due to changes in microbiota, such as an increase in the abundance of *Oscilospira, Mucisprillum,* and *Parabactoroides* species likewise decrease in *Clostridium,*

coprobacillus, and *Sporosarona* species, correspondingly the behaviour change was confirmed for anxiolytic effect. This framework has the potential to advance the treatment of clinical anxiety.

Key words: Bannanpeel; Fructo-oligosaccharides; Prebiotics; Antistress; *Caenorhabditis elegans*

P4-25

Adherence inhibition of shiga toxin producing (STEC) *Escherichia coli* by non-digestible oligosaccharides derived from *Saccharomyces boulardii* in *Caenorhabditis elegans* gut model

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Adherence is the first and one of the most important steps of bacterial pathogenesis. Natural derived components that inhibit the adherence of pathogens on the surface of epithelial cells, which have received considered interest. The major goal of this research was to assess the anti-adherence activity of mannan oligosaccharides (MOS) derived from probiotic yeast (*Saccharomyces boulardii*) against *Shiga toxin producing (STEC) Escherichia coli.* First the anti-adherence activity of MOS and their purified fraction (pMOS) was tested against three strains such as *Escherichia coli* ATCC and two isolated *STEC* strain of *E. coli* O157.H7 & O145:NM (Accession Number- MH180007, MH180008). Results shown significant reductions in adherence (up to 25%) of all STEC *E. coli* strains in presence of MOS (1 mg/mL). The mannan oligosaccharide fraction appear to be the responsible for the anti- adherence activity of MOS. Adherence inhibition (up to 20%) was also observed in presence of Mannan from *Saccharomyces cerevisiae* Sigma (M7504) at the highest concentration of 5 mg/mL of all the strains. Additionally, based on Liquid chromatography (HPLC), it was confirmed as 16 mg/1g of mannan produced from 24h grown *S. boulardii* in optimized media based on the surface methodology, further the extracted mannan oligosaccharide structure was characterized and compared with standard mannan based on Nuclear magnetic resonance (c, h NMR) and Fourier-transform infrared spectroscopy (FTIR). Subsequently longer life span was observed in *C.elegens* In vivo Model and further based on Ex-vivo (cytotoxicity assay) the extracted Mannan showed no

toxic effect. These results show that naturally derived molecules as MOS can be used for human food and for animal feed to reduce pathogens colonization and prevent the onset of infection.

P4-26

Antimicrobial efficacy of slightly acidic electrolyzed water combined with bay leaf (*Laurus nobilis* L.) essential oil against cariogenic *Candida albicans, Streptococcus mutans* biofilms

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Among oral diseases, dental caries is a disease that occurs through the formation of a biofilm by the attachment of oral pathogenic microorganisms to the tooth surface. Alcohol-based mouthwashes used to prevent tooth decay have a problem in that they can cause dry mouth when used by the elderly or children. Hence, The purpose of this study to development of an effective mouth wash solution based eco-friendly disinfectants using a combination of slightly acidic electrolyzed water (SAEW) with essential oil to inhibit dental caries-causing pathogenic biofilm.The cariogenic pathogens were treated with different SAEW three types of ppm values (5,10,20) for 30 and 60 seconds and subsequently the colonies were counted. The results indicated that among the 8 types of essential oil, bay leaf oil(BL), which showed the highest susceptibility in disk diffusion analysis were used to develop efficient combined disinfectants. Simultaneously Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC) were conducted for setting the optimum concentration of EOs and monolaurin (ML) for manufacturing emulsion. Inactivation of cariogenic pathogens was performed by dipping method ($p > 0.05$). Further, MTT assay was assessed to evaluate the non-cytotoxic effect on combination of (SAEW+BL+ML) as a disinfectant. This study demonstrates the potential of SAEW combined with essential oil as promising alternative disinfectant material for treatment of cariogenic bacteria infection.

P4-27

The use of commercial wine yeast *Saccharomyces cerevisiae* EC1118 for cassava ethanol production at high solids loading by separate hydrolysis & fermentation and simultaneous saccharification & fermentation

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Cassava is one of the most commonly imported raw materials for ethanol fermentation for the manufacture of food-grade distilled spirits in Korea. In cassava-producing countries, such as the Lao PDR, cassava can be considered low-price biomass for the production of bioethanol. In this study, the commercial wine yeast *Saccharomyces cerevisiae* EC1118 was tested for ethanol fermentation using cassava powder at a high solids loading (30%, w/v). α-Amylase and glucoamylase were used for the hydrolysis of cassava starch into glucose. To identify a suitable fermentation process for cassava, separate hydrolysis and fermentation (SHF) and simultaneous saccharification and fermentation (SSF) were compared. From the complete enzyme hydrolysis of cassava, 254.1 g/L of glucose was obtained. SSF showed higher ethanol titer during the first 12 h of fermentation, but SHF showed a higher ethanol titer after 24 h of fermentation. Finally, there was no significant difference between SHF and SSF in the final ethanol titer after 48 h fermentation (133.6 and 130.6 g/L, respectively). In summary, both SHF and SSF are applicable for ethanol production with high solid cassava using wine yeast EC1118 under the test conditions.

P4-28

Quality evaluation of fresh-cut vegetables and fruits purchased from online and offline markets

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The purpose of this study is to establish hygiene standards for product development by evaluating the physicochemical and microbiological quality of fresh -cut vegetables and fruits purchased from online and offline markets. For samples, fruits (melon, pineapple, mixed fruits; 15 products) and vegetables (lettuce, romaine, mixed vegetables; 15 products) were purchased online and offline. The samples were analyzed for physicochemical (pH, Hunter color, hardness, polyphenol) and microbiological (number of bacteria, coliform group, *Escherichia coli,* fungi and 9 types of food-borne pathogens) factors. Fruits were highly contaminated by bacteria (4.48±1.72 log CFU/g) and fungi (3.66±1.22 log CFU/g), and the average number of coliform group was 1.08±1.31 log CFU/g, which was detected in 40% of samples. The average number of *E. coli* was 0.47±1.00 log CFU/g, and two samples were found to be E. coli positive. Vegetables were highly contaminated by bacteria (5.98±1.43 log CFU/g) and fungi (3.65±0.73 log CFU/g), and the average number of coliform group was 0.66±1.23 log CFU/g, which was detected in 27% of samples. The average number of *E. coli* was 0.25±0.73 log CFU/g, and one sample was found to be *E. coli* positive. *Clostridium perfringens, Salmonella* spp. *Staphylococcus aureus, Bacillus cereus, E. coli* O157:H7, *Listeria monocytogenes, Yersinia enterocolytica, Campylobacter jejuni/coli,* and *Enterobacter sakazaki* were not detected in any fresh-cut vegetables and fruits.

P4-29

Method validation for quantitative analyzing aflatoxin productivity in *Aspergilllus* sp. isolated from traditional soybean paste.

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Aspergillus sp. is dominant fungi in the Korean traditional fermented food and well-known to produce mycotoxin including aflatoxin (B1, B2 G1 and G2). The aims of this study were to compare the LOQ and LOD among the aflatoxin quantitative methods of UPLC-FLD, HPLC-FLD and aflatoxin ELISA kit for screening of non-aflatoxigenic *Aspergillus.* In our study, we used 11 isolates from *Jang* (4) and *Nuruk* (2) with comparative strains (negative 2 and positive 3). As the results, P5 strain identified as *A. oryzae* at least of 99% and isolated from *Jang* was quantified a low value of 10.3 ppb in ELISA kit, while a high value of 568.58 ppb in UPLC analysis. In addition, *A. flavus* KACC 46453 as positive reference was quantified a low value of 11.5 ppb in ELISA kit and a high value of 1,335.77 ppb in UPLC. In conclusion, for the use of *Aspergillus* as starter, not only genetic identification but also quantitative analysis of mycotoxin by trusty analytical method is essential.

P4-30

Immune-modulating effect of *Leuconostoc mesenteroides* K2-4 isolated from radish kimchi

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Leuconostoc mesenteroides (Leu.) is one of lactic acid bacteria (LAB) found during the initial Kimchi fermentation and is a well-known starter on the beneficial effect such as immunomodulation by generating EPS. In this study, we determined the immune-modulating activity among the 5 LAB including *Leu. mesenteroides* (K1-18, K2-1, and K2-4 etc.), *Weissella cibaria* K1-8, and *Leu. citreum* K1-17 isolated from the radish kimchi. The immuno-modulatory effect among 5 kinds of the LAB isolates were compared with *Lactobacillus rhamnosus* (*L.*) ATCC 53103, which is an well-known immune enhancer. Of them, the K2-4

was notably activated the RAW blue macrophage cell with/without stimulation of LPS. Especially, the NF-κB activation and NO production were increased as well as 2 fold in comparison with control. Moreover, the TNF-α and IL-6 cytokines were produced at the level of 1.3 and 9 folds, respectively. Accordingly, *Leu. mesenteroides* K2-4 had the higher immuno-modulatory effect than *L. rhamnosus* ATCC 53103. Additionally, in the LPS-stimulated condition, the K2-4 strain was also indicated the immune-suppressive effect. In the further study, it is necessary to investigate the immunity associated biomarkers for the probiotic use of *Leu. mesenteroides* K2-4.

P4-31

Rapid and economical fermentation of shiitake-soy sauce using the cap of *Lentinus edodes*, medicinal herbs and meju powder

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Shiitake (*Lentinus eodes*), an edible mushroom, has been cultivated and consumed as food and traditional medicine in many Asian countries, including Korea. Shiitake has 90% water, 7% carbohydrates, 2% protein and less than 1% fat, and rich sources of B vitamins and minerals. In this study, high quality shiitake-soy sauce was produced using the cap (pileus) of shiitake, medicinal herbs (the root of *Rehmannia glutinosa, Angelica gigas,* the root and stem of *Achyranthes japonica* Nakai, the stem of *Hovenia dulcis* var. koreana), and meju power. Traditional soy-sauce production has complicated process, such as stemming of soy, grinding and molding of soy into meju, solid fermentation of meju for several months, and salt water extraction for mature maju, and proloned fermentation of liquid soy water extract. However we have developed a rapid, economical and efficient fermentation process and about 5~7 days fermentation at 30℃are needed for high quality shiitake soy sauce. The advanced process include (1) recover of cap, (2) extraction of cap with hot water (~20% salt), (3) hot water extraction of medicinal herbs, (4) mix of (2) and (3), (5) fermentation by addition of soy and meju powder. The cap after extraction could be used for other Korean Jang product, such as shiitake gochu-jang. Since, the anti-oxidant activities and α-glucosidase inhibition activities of stipe are 2~2.5 folds higher than those of cap, the stipe was also

recovered, dried and re-used as seasoning powder. Our results provide the economical and rapid fermentation of functional shiitake soy sauces are possible based on cap-stipe separation and newly developed process.

P4-32

Safety evaluation of *Leuconostoc mesenteroides* K2-1 isolated from the korean radish watery kimchi, Dongchimi

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The genera *Weissella* and *Leuconostoc* involve in initial kimchi fermentation and their beneficial effects on antagonistic, immune-modulating, and antioxidant activities have been published. In our study, we performed the safety evaluation of 18 lactic acid bacteria (LAB) isolated from 2 kinds of the Korean radish kimchi (Dongchimi and Chonggakkimchi) in terms of antibiotic resistance, haemolysis, antagonistic ability, and biogenic amine production. As a result, only 5 LAB isolates were not resistant to 9 kinds of antibiotics proposed by EFSA (AM, CH, CL, EM, GM, KM, SM, TC, and VA). Moreover, their β-haemolysis and productivity of biogenic amines, which is due to the presence of histidine and tyrosine, were not detected. Finally, it needs to examine the other food safety issues for the use as fermented culture starter.

P4-33

Anti-inflammatory effects of heat-killed lactic acid bacteria in LPS-stimulated RAW 264.7 cell

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Probiotic bacteria can interact with the gut microbiome to strengthen the immune system, principally due to their role in immune system modulation and the anti-inflammatory response. The use of heat-killed cells, which still maintain their bio-functionality, can elongate the shelf-life and simplify the food-processing steps of probiotic foods, given their high stability. Thus, the

present study aimed to investigate the anti-inflammatory effects of heat-killed Lactobacillus plantarum ICFPL-001 isolated from Kimchi using RAW 264.7 cells treated with lipopolysaccharide (LPS). Our results showed that treatment with heat-killed ICFPL-001 decreased nitric oxide and prostaglandin E2 production via downregulation of the inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2). In addition, treatment with heat-killed ICFPL-001 suppressed the expression of pro-inflammatory cytokines, interleukin-1β (IL-1β), IL-6, and tumor necrosis factor-α (TNF-α). Therefore, these data suggest that heat-killed ICFPL-001 could be a good candidate for development as a functional probiotic products manufacturing in the improve the anti-inflammatory effect.

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P4-34

Anti-stress effects of potential probiotic lactococcus lactis subsp. cremoris against corticosterone-induced apoptosis in PC12 cells

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Probiotic especially lactic acid bacteria can modulate the stress response and improve mood and anxiety symptoms in patients with chronic fatigue and irritable bowel syndrome. Also, glucocorticoid steroid hormones, such as cortisol and corticosterone, provide a rapid response to both physical and psychological stress, and act on areas of the brain that influence learning, memory, and behaviour. Lactococcus lactis subsp. cremoris is a lactic acid bacterium commonly used in the cheese manufacturing industry and has recently been attracting attention for its role as a probiotic strain. Thus, the present study aimed to investigate the anti-stress effects of Lactococcus lactis subsp. cremoris isolated from cheese aging cave in Imsil in PC12 cells treated with corticosterone and its underling mechanisms. Furthermore, the viability of the cells, the apoptosis of the cells, the level of phosphorylation of extracellular signal-regulated kinases (p-ERKs) and cleaved caspase-3 expression were measured by LDH and MTT assays. Our results showed that corticosterone

induced cells viability loss, cell apoptosis, down-regulation of p-ERKs and up-regulation of cleaved caspase-3. In addition, the effects induced by corticosterone were attenuated by probiotic bacteria pretreatment. Therefore, these data suggest that probiotic bacteria protect PC12 cells from corticosterone-induced apoptosis through activating ERKs signaling pathways. Also, the probiotic bacteria could be a good candidate for development as a functional food supplement in the improve the anti-stress effect.

P4-35

Stability and antibiofilm efficiency of slightly acidic electrolyzed water against mixed-species of *Listeria monocytogenes* and *Staphylococcus aureus*

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Adhesive bacteria and their biofilms on the surface of food processing equipment are the sources of cross-contamination, leading to the risk for humans. In this study, we investigated the physical properties changes and disinfection abilities of SAEW under different conditions. Furthermore, we examined the disinfection abilities of SAEW after 12 months shelf life on a mixed-species biofilm of *Listeria monocytogenes* Scott A and *Staphylococcus aureus.* The results showed that changes in the ACC and pH of the produced SAEW were generally affected by the storage conditions. Both spore-forming and non-spore-forming pathogens were not detected under treatment with 50 ppm SAEW for 5 min under HDPE-closed conditions throughout the whole storage period. Moreover, 25 mg/L SAEW can inactivate *L. monocytogenes* Scott A and *S. aureus* biofilm cells in ~2.45 and 2.57 log CFU/mL in biofilms within 5-min treatment. However, the decline of the two bacteria in the mixed-species biofilm was 1.95 and 1.43 log CFU/mL, respectively. *L. monocytogenes* Scott A was more sensitive to SAEW in the mixed-species biofilm cells. These findings exhibited strong antibiofilm activities of SAEW in impairing biofilm cell membranes, decreasing cell density, and eliminating biofilm.

P4-36

Diversity and mycotoxin production of fungi isolated from *Meju*

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Meju is a fermented soybean starting material for the preparation of traditional fermented foods such as soybean paste (*Doenjang*) and soy sauce (*Gangang*) in South Korea. Recently, the safety of soybean paste manufactured in a traditional ways is threatened because of the possibility of contamination with aflatoxins and ochratoxin A. In this study, we isolated fungi from *Meju* loaves and investigated the mycotoxin production of the microorganisms. The samples were mainly contaminated with *Aspergillus* (42.2%), *Penicillium* (11.1%), *Scopulariopsis* (11.1%), *Lichthemia* (11.1%) and others (24.4%). Five *A. flavus/oryzae* were isolated from *Meju* samples and three strains of them produced aflatoxins in a range of 1,404-1,444 μg/kg in the medium. On the other hand, *P. polonicum* and *A. ochraceus* isolated from *Meju* did not produce ochratoxin A in the medium.

P4-37

From food to gut: A novel luminescent tagging system to track lactic acid bacteria

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Limosilactobacillus reuteri has previously been engineered to accumulate therapeutic molecules inside the cells. During gastrointestinal transit, bacterial viruses lyse the recombinant bacteria, releasing the therapeutic molecule. While this approach has proven fruitful in various preclinical disease models, understanding microbial survival and therapeutic molecule release throughout the GI tract is critical to promote probiosis. Therefore, we adapted a luminescent tagging (HiBiT) system to quantify *L. reuteri* and its recombinant proteins. A translational fusion of recombinant protein with HiBiT tag yields a luminescent signal when combined with a substrate containing a HiBiT-interacting protein. Upon optimization, we confirmed that the HiBiT system quantifies *L. reuteri* in complex media over a range of 2 – 9 log CFU/mL. HiBiT system provides an exciting opportunity to detect and quantify

recombinant protein production in real-time. Oral administration of recombinant *L. reuteri* allowed the detection and quantification throughout the gastrointestinal tract and in feces with a limit of detection of 1,000 CFUs/g, equivalent to conventional plating. Lastly, the HiBiT system allowed the identification and quantification of *L. reuteri* within different food matrix, including yogurt and orange juice. Moreover, the HiBiT system was functional in all 11 lactic acid bacteria species tested. Thus, HiBiT tagging will be a promising detection tool in developing next-generation probiotics by simplifying the tracking of bacteria and protein expression in food and the GI tract.

P4-38

The change of color and pH value of skate muscle during fermentation at different fermentation conditions

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This study investigated the effects of fermentation conditions on the color and pH values of the fermented skate muscle up to 15 days at 10°C during fermentation. Three fermentation conditions, at air, vacuum and different gas composition (oxygen:nitrogen=100:0, 70:30, 50:50, 30:70 and 0:100) were used. The a* value of sample fermented at air decreased with increasing fermentation time. On the other hand, it decreased up to 10 days of fermentation and then started to decrease. The yellowness (b*) was decreased in the sample fermented at air and the sample fermented at 100% nitrogen. However, the pH values of the skate muscle increased significantly in all the fermentation conditions. In particular, pH of the skate muscle fermented at 100% nitrogen showed the least increment from 7.47 to 8.51 compared to the others, to more than 9.0. Therefore, to finalize the optimization of the fermentation condition for the fermented skate muscle, the chemical parameters of the skate muscle color, such as myoglobin, should be studied further in the future.

P4-39

Changes in intestinal microbiota according to consumption of cheonggukjang in an IBD animal model

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Both Crohn's disease (CD) and ulcerative colitis (UC) are inflammatory disorders of the gastrointestinal tract known as inflammatory bowel disease (IBD). *Cheonggukjang* is a traditional Korean fermented soybean paste, and it was fermented by potential probiotic microbes (*Bacillus* sp.). In this study, changes in intestinal microflora during the intake of *Cheonggukjang* were investigated using a mouse model of dextran sulfate sodium (DSS)-induced colitis. The 16S rRNA V3-V4 regions of collected mouse fecal samples were amplified using next-generation sequencing (NGS). Statistical difference between before and after intake groups in indices indicating the species richness (α-diversity) such as ACE, Chao1, and Shannon was confirmed significantly. Microbiome composition results showed that regardless of intake of *Cheonggukjang* or not the fecal microbiome is dominated at the phylum level by Firmicutes and Bacteroidetes; genus level by *Lactobacillus* and *Bacteroides.* Additionally, Linear Discriminant Analysis (LDA) Effect Size (LEfSe) analysis was performed to investigate the significant ranking of abundant taxa in the two groups. A size-effect threshold of 2.0 on the logarithmic LDA score was used for discriminative functional biomarkers. After ingestion of *Cheonggukjang,* the content of lactic acid bacteria was about 20 times higher than that of the normal group, and that of Bacteroides was about 3 times higher than that of the normal group and 1.2 times higher than that of the DSS group.

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P4-40

Enhanced phytoremediation and biosorption of cationic methylene blue (Acid Blue 93) dye by *Acidomyces acidophilus* ATCC 26774

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In this study, the enhanced phytoremediation and biosorption characteristics of cationic Methylene blue (MB) dye using *Acidomyces acidophilus* ATCC 26774 (UAMH 3535) were investigated. Inoculation with *A. acidophilus* ATCC 26774 increased the length of *Bassica juncea* L. roots by 82.3% and stems by 37.7% in the presence of 50 mg/L MB dye. Dried biomass of the *A. acidophilus* ATCC 26774 showed superior removal capacity (87.1%) of MB dye in aqueous solution. Maximum adsorption capacities were investigated at pH 11 (176.8 mg/g) and 0.09 g/20 ml dried biomass (120.3 mg/g), respectively. The influence of contact times (0-360 min), and initial concentrations (30.0-357.5 mg/L) on the biosorption of MB dye were investigated. Additionally, *A. acidophilus* ATCC 26774 was characterized using Fourier transform infrared spectroscopy (FT-IR) and point of zero charge (pHpzc). Equilibrium biosorption isotherms and kinetics results showed a Langmuir isotherm and Pseudo-second order kinetic models well fitted for the MB dye biosorption. Monolayer biosorption, intra-particle diffusion and chemisorption predicted to play a key mechanism in MB dye biosorption. In conclusion, *A. acidophilus* ATCC 26774 is proposed as a superior plant growth promotion bacteria and biosorbent with potentially applicable in removal of cationic MB dye from environmental.(This work was supported by a grant from the Establishment of Integrated Biobank for Agriculture, Food and Livestock Microbiome Project funded by the Ministry of Agriculture, Food and Rural Affairs (MAFRA))

P4-41

Quality characteristics and antmicrobial activity of black raspberry vinegars fermented by various acetic acid bacteria

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In this study was invetigated the quallity characteristics of black raspberry vinegar by various acetic acid bacteria (*Acetobacter pasteurianus* B1, B2, B3,

B4) and its antimicrobial activities. During fermentation, the total acidity of black raspberry vinegar increased steadily until day 20, with B1 showing the highest total acidity at 6.56%. The pH, sugar content and alcohol content were found to decrease during fermentation. Among the acetic acid bacteria, the acetic acid content of B1 was the highest at 61.13 mg/mL. The major free sugar of the black raspberry vinegar was mannitol. The total free amino acid content of the black raspberry vinegar by strain was the highest (0.42 mg/mL) of B1 vinegar strain. Further, it was confirmed that among the acetic acid bacteria, the antimicrobial activity of B1 was the highest. Therefore, the black raspberry vinegar fermented by B1 strain is expected to in industrial vinegar production.

P4-42

Screening of antagonistic bacteria having plant growth-promoting abilities and antifungal activity against phytopathogenic fungi

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Lately, the development of various biocontrol agents using microorganisms has been suggested as a remarkable alternative to chemical pesticides due to its several problems. In this study, a total of 157 bacteria strains were isolated, identified, and investigated for availability as a biocontrol agent from farmlands in Jeollabuk-do, Korea. Among the isolated strains, six biocontrol agent candidates that showed superior extracellular enzyme activities (EEA) were selected for further experiments. SRCM 121380 strain was finally selected as a biocontrol agent from additional bioactivity screening experiments such as anti-phytopathogenic fungal, siderophore, indole-3-acetic acid (IAA), and plant growth-promoting (PGP) activity. SRCM 121380 was identified as *Bacillus subtilis* by 16S rRNA gene sequencing analysis, additionally, its sugar fermentation and enzyme properties were investigated. The results suggested that B. subtilis SRCM 121380 could be a promising biocontrol agent with superior anti-phytopathogenic fungal and plant growth-promoting properties. (This work was supported by a grant from the Establishment of Integrated Biobank for Agriculture, Food and Livestock Microbiome Project funded by the Ministry of Agriculture, Food and Rural Affairs (MAFRA))

P4-43

Assessment of potential probiotic properties of lactic acid bacteria isolated from kimchi

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Kimchi is tranditional food in korea fermented by diverse lactic acid bacteria (LAB). LAB have been used as food ingredient conventionally because they are generally recognized as safe (GRAS) microorganism. Also LAB have several probiotic properties in human body such as improvement of the intestinal environment, and immune enhancement, because of their diverse physiological activity including bile salt hydrolase (BSH) activity and antibacterial activity. In this study, LABs were isolated from various kimchi and their probiotic properties were determined. All LAB isolates were tested in antibacterial activity, BSH activity, and DPPH scavenging activity. Among the isolates, biogenic amine (BA) production ability and thrombolytic activity of two LAB with the superior antibacterial activity were conducted for food safety. Additionally, cell adhesion test using the HT-29 cell and antimicrobial susceptibility test were conducted. Finally, SRCM 211921 strain was selected for further experiments and it was identified as *Lactobacillus paacasei* by 16S rRNA gene sequencing. These results indicated superior potential ability of Lactobacillus paacasei SRCM 211921 as a probiotic strain.

P4-44

Microbial diversity of representative traditional soy sauce, *Ganjang* in different regions of korea

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The purpose of this experiment was to study the bacterial diversity of traditionally fermented *Ganjang* from six typical regions (Gangwondo; GW, Gyeonggido; GG, Chungcheongdo; CC, Jeollado; JL, Gyeongsangdo; GS and Jejudo; JJ) of Korea and to further compare their bacterial biomarkers. The diversity of the microbiota of the *Ganjang* was studied using Illumina Miseq platform. The results showed that compared with the highest species richness and diversity of bacteria in GG, the bacterial richness and diversity of Gangang

was the lowest in JL. A microbial composition analysis revealed that *Lactobacillales* was the most dominant order in five regions (GW, GG, CC, JL, JJ), where as *Bacillales* was the most dominant order in GS. The main genus distribution of Ganjang in different regions is varied, but *Tetragenococcus, Bacillus* and *Chromohalobacter* were generally the main ones. Permutational multivariate analysis of variance (PERMANOVA) result showed that statistical differences in microbial compositions among six groups were significant at confidence level (p=0.011). Linear discriminant (LDA) effect size (LEfSe) analysis results showed that The composition of *Bacillus, Lactobacillus* and *Staphylococcus* was found to contribute the most to the difference in microbial trait among regions. [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 2022].

P4-45

Effect of xylan from barley (*Hordeum vulgare*) husk for prebiotic and antibacterial efficacy against multi-drug resistance *Staphylococcus aureus*

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Among traditional grains, barley (*Hordeum vulgare*) is a grain with high dietary fibre, protein, vitamins, and low-fat content. It is consumed majorly by milling, and the husk is an agricultural by-product discarded after milling. Recently, research has reported that the skin of beans and cereals contains a large amount of prebiotics. The current study focused on extracting and characterizing polysaccharides from barley husk (BH) discarded as a by-product. Further, the functional (prebiotic and antibacterial) activities were evaluated using *In vitro* and *In vivo* methods. In this study, HPLC profiling of TFA-hydrolyzed BH extract and confirmed to have the same properties as standard Xylan and the structural characteristics through FTIR, NMR. And the result of the growth promotion results for probiotic strains of the BH extract, the probiotic strains showed growth-promoting efficacy. The antibacterial activity effect of BH Xylan inhibited the biofilm formation of MDR *S. aureus* more than that of *S. aureus* ATCC. Morphology of the generated *S. aureus*

(MDR and ATCC) biofilm through a SEM, it was found that both BH Xylan and standard Xylan addition could effectively remove the biofilm. In addition, the prebiotic efficacy and antibacterial activity were confirmed as a result of qPCR analysis based on the marker gene. Therefore, in this study, polysaccharide (Xylan) extracted from barley husks discarded as a by-product was used as a prebiotic and antibacterial material for MDR *S. aureus,* so it is expected to be used as a natural high-value-added functional material.

P4-46

Microorganisms inactivation strategy after steaming process of rice cakes manufacturing for a small rice cake processing company

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The sterilization through heat treatment is the most commonly used sterilization process and is applied to many processed foods. The rice cake manufacturing process also includes a steaming process, which can reduce the microbiological risk of rice cake. However, after steaming, rice cakes could be re-contaminated during cooling, drying and packaging process. This study was conducted to establish effective microbial reduction strategy after steaming process of rice cakes(Garaetteok, Injeolmi, and Gyeongdan) which are the cooling, drying and packaging process as they are considered the important contamination points. 3ml of prethanol(75%), which is an ethanol permitted as a food additive, were used for each gram of rice cake as coolant in rice cake cooling process. A UV-C lamp (1000±50μW/cm^2) emitted radiation at 253.7nm was used for bean powder and bread crumbs, which are sub-ingredient of Injeolmi and Gyeongdan, in drying process. In packaging process, a vacuum packaging machine was used for packaging of rice cake. The result of alcohol treatment in rice cakes and UV treatment in sub-materials of Injeolmi and Gyeongdan showed a significant microbial reduction effect indicating 0.31 and 0.97 log CFU/g reduction of total aerobic bacteria and coliform by 1 min immersion of Garaetteok. In addition, UV-C treatment (12hours) reduced total

aerobic bacteria and coliform of bean powder by 0.41, 1.07 log CFU/g, respectively, and of bread crumbs by 0.34, 0.99 log CFU/g, respectively. The vacuum packaging of rice cake suggested the possibility of extending the room temperature storage of rice cake by reducing total aerobic bacteria and coliform by 1.43 and 1.40 log CFU/g, respectively compared to the control group during 16 hour room temperature storage.

P4-47

Occurrence of mycotoxigenic fungi and mycotoxins in peanuts during storage

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The purpose of this study was to evaluate the occurrence of mycotoxigenic fungi and mycotoxins in peanuts (with and without shell) during storage. Peanuts were stored at four conditions (4℃, 8℃, 14℃, 21℃) and the kernels of each sample were analyzed bi-monthly over a one-year period. Peanut samples were mainly contaminated with *Aspergillus, Penicillium* and *Fusarium* species and at least ten other genera were detected. After two months storage, the level of fungal contamination increased sharply to 100% in the peanuts without shell regardless of storage condition and *Penicillium* species was predominant. For the peanuts with shell, fungal contamination increased up to 79.1±20.3% at 12 months. *Aspergillus* species was predominat in the kernels of peanuts with shell and the frequency of *Aspergillus* was dependant more on humidity than temperature unlike the samples without shell. After 12 months of storage, the lowest level of fungal contamination was detected at 8℃ and 50% relative humidity condition in the peanuts with shell. Ochratoxin A was detected only one sample of without shell (37.31 ug/kg), whereas aflatoxins were not detected. This study suggests that peanuts should be stored in their shells below 8℃ and 50% relative humidity to avoid contamination with mycotoxigenic fungi and mycotoxin.

P4-48

Lactobacillus plantarum GS100에서 유래한 2종의 β-glucosidase를 이용한 Rubusoside 생산

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Rubusoside는 steviol glycoside로서 *Rubus suavissimus* S. Lee와 *Stevia rebaudiana* (Asteraceae) 등의 잎에 존재하는 희소당이다. 그러나, rubusoside의 생산 비용은 stevioside와 같은 다른 steviol glucoside보다 약 10배 이상이며 추출 및 정제에 대한 경제적 환경적 부담이 크다. 대부분 rubusoside는 stevioside를 β-glucosidase, β-galactosidase 또는 lactase 등의 생물전환을 이용 stevioside의 C-13 부위의 β-1,2 결합된 glucose를 분해하여 얻을 수 있다. 본 연구실의 선행연구를 통해 식품허용 유산균인 *Lactobacillus plantarum* GS100가 stevioside를 생물전환하여 rubusoside를 생산할 수 있음을 보고하였다. 본 연구에서는 rubusoside 생성능을 보인 유산균의 전체 유전자서열 분석을 통해 2종의 β-glucosidase가 존재함을 확인하였고 두 유전자를 클로닝하여 IPTG 유도에 의해 18℃에서 21시간 재조합 단백질을 생산하였다. 효소특성을 조사한 결과 2종 효소는 각각 rubusoside producing enzyme (RPase), steviol glucoside producing enzyme (SGPase)이라고 명명하였다. SGPase는 stevioside와 rebaudioside A로부터 주로 rubusoside, rebaudioside B를 생산하였다. 또한, RPase는 steviosde로부터 주로 rubusoside를 생산하였다. 본 연구를 통해 *L. plantarum* GS100에서 유래한 2종의 β-glucosidase 모두 stevioside로 부터 rubusoside를 생산하였고 향후 고감미 소재 및 가용화 소재를 대량생산이 가능하다는 것을 확인할 수 있었다.

P4-49

Comparative study on quality characteristics and antioxidant activity of *Glycyrrhiza glabra* fermented with *A. awamori* and *A. luchuensis*

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In this study, two different strains were used as fermentation materials of Glycyrrhiza glabrata, and the quality characteristics and antioxidant activity of licorice after inoculation and fermentation were investigated after inoculated into *Glycyrrhiza glabra* produced in Uzbekistan. After correcting the moisture content of *Glycyrrhiza glabra* in Uzbekistan, sterilized and inoculated strains at

1% for fermentation comparison, and the samples were ultrasonically extracted in 70% ethanol, freeze-dried for analysis. The quality characteristics of pH, acidity, and reducing sugar were investigated. ABTS radical scavenging activity was 58.60% for C, 69.71% for W4, 69.34% for B4, which was slightly higher in the W4 sample group, and DPPH radical scavenging ability was 76.75% on the fourth day of *A. luchuensis* fermentation. The total phenol content of W4 sample was 49.21 mg%, *Glycyrrhiza glabra* produced in Uzbekistan was about 2 mg% higher than that of *A. luchuensis* fermented with *A. awamori* N60247. Therefore, the antioxidant activity of *Glycyrrhiza glabra* produced in Uzbekistan fermented with *A. luchuensis* was higher than that of *A. awamori N60247* fermentation, suggesting that it can be used as a fermentation material.

P4-50

대체감미료를 이용한 저칼로리 콤부차 제조 및 특성

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콤부차(Kombucha)는 효모와 초산균 등을 포함한 스코비(SCOBY)와 홍차 또는 녹차를 우려낸 추출물과 당을 첨가해 발효한 음료이다. 설탕 등의 당이 발효에 있어 중요한 요소이나 당 함량에 따라 칼로리가 높아질 수 있다는 문제점을 수반한다.

본 연구에서는 저칼로리 콤부차 제조를 목적으로 비정제 원당의 함량을 달리한 대체감미료(난소화성 말토덱스트린, 효소처리 스테비아, 수크랄로스)를 첨가한 콤부차를 제조하여 콤부차 발효특성, 콤부차 내 생성된 유기산, 카테킨 및 카페인 함량변화를 측정하고, 음료 등의 식품소재로서의 특성을 조사하였다. 2주일 동안 발효를 통해 제조된 콤부차의 색도는 전반적으로 커다란 차이를 보이지 않았지만, pH는 초기 5.4에서 pH 2.81로 감소하였다. 모든 콤부차에서 acetic acid, citric acid, succinic acid는 공통적으로 측정되었고, 특이하게도 대체감미료를 첨가한 콤부차에서는 D-gluconic acid가 높게 확인되었다. 카테킨 함량은 발효기간 중 커다란 변화를 보이지 않았지만, 카페인은 발효 초기와 비교하면 5배 감소하였다.

본 연구에서는 기존 콤부차에 필수적인 설탕 함량을 낮추고 대체감미료를 첨가한 저칼로리 콤부차 개발이 가능하였고 새로운 저칼로리 건강발효 음료개발의 가능성을 제시하였다.

P4-51

Synthesis of TtCITase-C derived glucosyl products from disaccharides by a CITase from *Thermoanaerobacter thermocopriae*

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In this study, the transglycosylation activity of C-terminal region of *Thermoanaerobacter thermocopriae* cycloisomaltooligosaccharide glucanotransferase (TtCITase-C) was investigated with several disaccharides such as maltose, isomaltose, cellobiose, and palatinose. The reaction products were measured by TLC and HPLC. The results showed that with maltose and isomaltose as good acceptor, a series of isomaltooligosaccharides with degrees of polymerization (DP) from 3 to 7 were produced, and cellobiose, palatinose as acceptor, TtCITase-C catalyzed to form cellobiose-derived oligosaccharides, palatinose-derived oligosaccharides up to DP7 and DP8, respectively. The molecular mass of TtCITase-C derived glucosyl products were determined by LC/MS analysis. The transglycosylation of the disaccharides with α-(1 → 6) linkages was shown by 1H NMR analysis confirming the structure of these oligosaccharides. This study showed the production of TtCITase-C-derived oligosaccharides establishing a promising avenue for future applications such as slowly digestion saccharides or functional food materials.

P4-52

Isolation and identification of nitrite producing lactic acid bacteria from fermented foods

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Nitrate is reduced to nitrite and is not only used as a preservative and hardener for processed meats, but also useful for vasodilation in the body.

However, synthetic nitrates can be converted to carcinogenic nitrosamines when processed meat products are heated. In order to prevent the formation of

carcinogenic nitrosamines, it is necessary to investigate natural nitrites that can replace synthetic nitrites. This study was conducted to isolate lactic acid bacteria with high natural nitrite production from *Lee Hwa-Ju* among traditional *Makgeolli.* Total 2100 bacterial colonies were selected and their nitrite production was measured with *Bacillus subtilis* KCTC 12501BP as the positive control for its known nitrite production. Five strains selected that the high nitrite production using nitrate reduction test. The strains were identified as *Pediococcus pentosaceus.*

P4-53

Isolation and characterization of *Escherichia coli*-specific bacteriophage for eco-friendly biocontrol agent

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Antibiotic resistance in *Escherichia coli* is occurring worldwide and became major threat to food safety because this bacterial species can accumulate resistance genes through horizontal gene transfer. The purpose of this study was to isolate and characterize a *E. coli*-specific phage (EC phage) for using as an eco-friendly biocontrol agent. EC phage was isolated from potato crop soil. Its specificity was determined against 68 foodborne pathogen strains by dot assay. EC phage was exposed to various pHs (1−12) and temperatures (-70−70˚C) for the confirmation of phage stabilities. UV and agricultural antibiotic stability were determined by plaque assay after 1-h exposure to UV (365 nm) and 6 agricultural antibiotics including streptomycin, oxolinic acid, validamycin, kasugamycin, polyoxin B, and oxytetracycline. Phage efficiency was investigated by challenge assay at a MOI of 0.01, 0.1, 1, and 10 and the viable bacterial number was counted at 4 h intervals for 52 h using TSA plates. EC phage exhibited narrow specificity against 3 strains of *E. coli.* EC phage was stable at wide range of pHs (3−11) and stable at -70˚C to 37˚C although there are 1 log reduction at 50˚C, 3 log reduction at 60˚C. The phage also stable at UV, and all 6 agricultural antibiotics. As a result of challenge assay, it was found that the greatest bacterial reduction occurred at MOI 10 after an incubation period of 4 hours (about 4 log reduction). Different MOI showed the greatest reduction at different incubation times: At 16 h (MOI 1), 24 h (MOI 0.1) and 40 h (MOI 0.01).

This study demonstrated that EC phage can be useful as an eco-friendly biocontrol agent against antibiotic resistant *E. coli.*

P4-54

Manufacturing air-blast dried lactic acid bacteria starter for *Makgeolli* brewing

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Makgeolli is made by complicated interaction combination vario using freeze-drying technology. However, air-blast drying technology is highly economical so, it considered a promising alternative drying technology. we investigated LAB starter using air-blast drying technique, and established optimal conditions to improve the survival rate of LAB. Experiments were conducted alongside the optimization of protectant and rehydration conditions using three types of sugars (sorbitol, trehalose, glucose) and three types of rehydration solutions (distilled water, 1x phosphate buffered saline, 0.85% NaCl) to enhance the viability and storability of air-blast dried LAB cells.

This study is expected to be used as a basic research for the production of LAB-added *Makgeolli.* and to increase economic feasibility of LAB starter production in the *Makgeolli* industry

P4-55

A comparative study of disinfectants against *Salmonella* Typhimurium on chicken skin and food-contact surfaces

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In this study, three different disinfectants, chlorine dioxide (ClO_2), sodium hypochlorite (NaOCl), and peroxyacetic acid (PAA) were applied against *Salmonella enterica* serovar Typhimurium, a potential foodborne pathogen. The efficacy of the disinfectants was investigated in pathogenic suspension providing

clean and dirty environmental conditions. The result showed antibacterial activity in every state of condition for all disinfectants. However, PAA showed the highest activity in comparatively lower concentrations (40 ppm). Additionally, the antibiofilm activity of these disinfectants was also investigated on stainless steel, plastic, silicon rubber, and chicken skin surfaces. Complete biofilm removal was only observed after PAA usages on stainless-steel and plastic surfaces. PAA and ClO_2 showed very effectively on chicken skin surfaces in a 5 min treatment. A similar observation was found by field emission scanning electron microscopy and confocal laser scanning microscopic analysis. From this study, it can be concluded that PAA is a more effective disinfectant than the selected other sanitizers.

P4-56

Manifolds of flavourzyme on biofilm formation, quorum sensing, and virulence gene expression of *Pseudomonas aeruginosa*

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The persistence of biofilms is a global burden on the food industry, as *Pseudomonas aeruginosa* is responsible for a wide range of food spoilage, posing a severe economic and public-health concern through cross-contamination. Many natural compounds show potential as biofilm inhibitors, including enzyme-based inhibitors. The current study investigated a preventive approach against *P. aeruginosa* biofilm formation using a food-grade peptidase, Flavourzyme. Results revealed that a co-culture with 300 µL/mL (1 MIC) of Flavourzyme could kill *P. aeruginosa.* The biofilm formation, motility and the production of AHLs were also reduced from 0.06 MIC and undetectable with 0.125 MIC of Flavourzyme. Interestingly, 0.03 MIC of Flavourzyme showed diverse expression levels of quorum sensing (QS) and virulence regulating genes. However, ≥0.06 MIC of Flavourzyme significantly suppressed the relative genomic expressions of QS and virulence regulating genes. Based on our findings, we suggest specific concentrations of Flavourzyme against *P. aeruginosa* biofilm as an effective antibiofilm agent, presumably by blocking bacterial safeguarding machinery once the cellular proteins are disrupted.

P4-57

농·수·축산물 원재료 중 천연유래 보존료(프로피온산, 안식향산, 소브산)의 검출 및 인정 현황 분석

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보존료(프로피온산, 안식향산, 소브산 등)는 품질 저하를 방지하여 식품의 보존기간을 연장하는 식품첨가물을 말한다. 보존료는 식품 제조·가공 시 사용되는 식품원재료에 천연적으로 함유되어 있거나 인위적으로 첨가하거나 발효과정 및 제조과정 중 생성되거나 선도 저하, 부패 등 취급상 부주의한 경우에도 발생하고 있다. 그러나 인위적 첨가와 천연 유래의 구분이 어렵고 천연 유래 판단의 근거도 부족한 실정이다. 본 연구의 목표는 농·수·축산물 중 천연유래 보존료의 인정 사례, 부적합 사례, 검출 농도를 조사하고 데이터베이스화 하여 현황을 파악하는 것이다. 식품공전의 기준에 따라 식품 유형을 대분류(23), 중분류(92), 소분류(236), 및 세부 품목으로 나누었다. 식품안전나라 사이트, 학술논문, 연구보고서 등을 바탕으로 3가지 천연유래 보존료(프로피온산, 안식향산, 소브산)의 검출량(ppm), 검출된 식품 유형 등을 조사하여 보존료의 인정, 부적합, 검출범위 현황을 데이터베이스화 하였다. 농·수·축산물 180건에 대한 3가지 보존료 천연유래 인정 사례 조사 결과, 유가공품에서 검출된 과량의 프로피온산 4,138 ppm(프로피온산 일괄인정기준 100 ppm)을 천연유래로 인정한 사례가 있었고, 안식향산의 경우 두류가공품에서 검출된 300 ppm(안식향산 일괄인정기준 20 ppm)을 천연유래로 인정한 사례가 있었다. 부적합 사례를 조사한 결과, 프로피온산이 검출된 337건 중 발효식초에서 79건, 안식향산이 검출된 483건 중 당절임에서 70건, 소브산이 검출된 273건 중 빵류에서 85건의 부적합 사례가 보고됐다. 식품 원재료중 보존료가 검출된 3,358건의 연구, 조사 결과를 분석해 보면, 발효식초에서 961.9 ppm 농도의 높은 프로피온산 검출량이 나타났다. 안식향산은 절임식품인 피클에서 2,192.4 ppm의 검출량을 보였으며, 소브산은 건조육에서 1,500 ppm 검출되었다. 이런 결과를 분석해 볼 때, 식품 유형별로 천연유래 보존료의 인정 범위, 부적합 사례, 검출 농도 등을 고려해 인정기준을 재조정할 필요가 있다고 판단된다. 또한 이들 자료를 식품 중 천연유래 식품첨가물 입증 시 활용함으로써 체계적이고 과학적인 보존료의 안전관리에 기여할 수 있을 것으로 기대된다.

P4-58

Characterization and genomic analysis of a lytic phage as a biocontrol strategy against *Pectobacterium carotovorum* subsp. *carotovorum*

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Soft rot caused by *Pectobacterium carotovorum* subsp. *carotovorum* (PCC) is a serious threat to pre- and/or post-harvest of fresh produce. The purpose of this study was to characterize PCC phage previously isolated from tomato soil as a biocontrol agent for controlling PCC in field. PCC phage was exposed to UV irradiation or six agricultural antibiotics for 1 h, respectively, to investigate its stability under harsh conditions. For assessing the bactericidal effect of phage, it was added to PCC suspension at a MOI of 0.01 to 10 and the bacterial counts were determined by plate count method. Finally, whole-genome sequencing of phage was performed and annotated for identifying its lytic property, novelty and safety. PCC phage was significantly stable at five agricultural antibiotics and maintained its lytic activity more than 93% after UV irradiation. The bactericidal effect of phage was maximum after 6 h with 3 logs reduction of PCC and PCC growth was recovered after 21 h. PCC phage was consisted of 148,167 bp with GC content of 50.55% without genes encoding lysogenic property, virulence, antibiotic resistance, and potential allergens. In conclusion, it was demonstrated that our PCC phage with excellent environmental stability, lytic activity as well as safety was promising to be used as a biocontrol agent against PCC.

P4-59

Phycocyanin production and antioxidant activity of the heterotrophically cultivated *Galdieria sulphuraria* 074G

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Galdieria sulphuraria is known to grow heterotrophically and produce phycocyanin (PC). The objectives of this research are to 1) select the optimum basal medium for PC production of *G. sulphuraria* 074G; and 2) evaluate the

antioxidant activity of the *G. sulphuraria* 074G extract. *G. sulphuraria* 074G was heterotrophically cultivated in the presence of glucose on the basal media including Cyanidium medium (CN), Ford medium (F) and CN+F medium. The heterotrophic growth *G. sulphuraria* 074G was followed by measuring the absorbance and dry cell weight (DCW). The PC concentration was also measured during cultivation. The antioxidant activities of cell extract were evaluated by determining total phenolic content (TPC), total flavonoid content (TFC), 1-diphenyl-2-picrylhyorazy (DPPH) scavenging activity, and ferric reducing antioxidant potential (FRAP) assay. As glucose concentration decreased, the biomass increased during 7 days. The algal growth and PC production in CN+F medium exhibited the highest among the tested media. The DCW and PC concentration were 4.85 g/L and 102.62 mg/L, respectively. The optimum inoculation density was determined as 0.4 g/L. The antioxidant activity of methanol extract was the greatest among the tested solvents. The TPC, TFC, DPPH and FRAP values of the extract were determined as 10.92 mg GAE/g, 8.86 mg QE/g, 173.4% and 3.17 mM Fe2+/g, respectively. This research suggests that *G. sulphuraria* can produce PC heterotrophically, and the cell extract possesses antioxidant activity for potential use as a functional food.

P4-60

An in-vitro assessment of the cholesterol-lowering efficacy of potential probiotic *Lactobacillus rhamnosus* - Isolated from ginseng sprouts

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Cholesterol assimilation by probiotics in the gastrointestinal tract might allow for lowering cholesterol levels available for absorption. This study aims to isolate and characterize potential probiotics from Ginseng Sprouts by evaluating their resistance to gastric acidity and bile salt, analyzing functional attributes, and then investigating the possibility of cholesterol-lowering levels through bile

salt hydrolase activity and cholesterol assimilation rate. In this study, we isolated 5 strains of *L. rhamnosus* and then conducted 0.3% bile tolerance test, acid tolerance test(pH 3), antimicrobial activity (against *Escherichia coli* & *Staphylococcus aureus*), and antioxidant activity (DPPH and ORAC assay) to certify probiotic potentiality. Viability against gastric acidity and bile salt ranged 6.85±0.004 (log10CFU/ml) to 7.14 ±0.09(log10CFU/ml). Inhibition activity against *E. coli* and *S.aureus* ranged 13.5±0.17mm to 15.24±0.49mm. The DPPH free radical scavenging activity around 53%±0.02. From these results, our isolated *L. rhamnosus* strains may serve as a promising probiotic candidate. Thus, we are going to experiment with bile salt hydrolase activity and cholesterol assimilation rate. As our isolated *L. rhamnosus* is a probiotic candidate and showed the potential to grow in the presence of bile, we expect that these probiotics can display substantial bile salt hydrolase activity and also can reduce serum cholesterol levels from a laboratory growth medium.

P4-61

Change in pysicochemical and sensory quality of moromi fermented with different *Aspergillus oryzae* strains

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Aspergillus oryzae plays an important role as a starter in the fermentation of koji and moromi. However, the effect of the different *A. oryzae* strains on quality of moromi has been rarely studied. In this study, the physicochemical properties, enzyme activity, sensory evaluation, and metabolite profiles of moromi samples fermented with two strains (*A. oryzae* 102021 and 102487), which was newly isolated from soy fermented foods, were analyzed and compared to those of a commercial strain (control). Amino-type nitrogen contents of 102021- and 102487-moromi samples were higher than that of control moromi, and their amylase and protease activities were also higher. Moreover, metabolite profiles of moromi were significantly changed according to the strains. In particular, the levels of many amino acids, peptides, nucleotides, and acidic compounds were altered resulting in the change in the sensory

quality of moromi. Although volatile compounds were not investigated, the results suggested that the quality of moromi was significantly different by newly isolated strains, especially *A. oryzae* 102487, were superior to the commercial strain in terms of taste-related substances. Therefore, these strains could be used as good starters to produce moromi and soy sauce with good sensory quality.

P4-62

Manufacture of fermented *Lentinula edodes* by phytolactic acid bacteria

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Lentinula edodes is used as an edible and medicinal mushroom in Asia. In particular, it is one of the most consumed mushrooms in Korea. Lentinan and eritadenine contained in *L. edodes,* those components were well known for inhibit platelet aggregation and exhibit antiviral action, and thus are used as raw materials for food and medicine. Lactic acid bacteria is microorganisms that are widely used in the production of various fermented foods such as cheese and fermented milk. Lactic acid bacteria is actively researched for the effect of improving the intestinal microbial flora, producing physiologically active substances and low-calorie sugars such as riboflavin, folate, and alanine, also, producing oligosaccharides. Recently, phytolactic acid bacteria isolated from vegetable raw materials such as kimchi and soybean paste, which are traditional Korean foods are in the spotlight. In this study, we development the food materials that can improve the functionalities of phytolactic acid bacteria fermentation. Biological active and optimal fermentation conditions of *L. edodes* by phytolactic acid bacteria were established. Fermented *L. edodes* by phytolactic acid bacteria were prepared, and useful components were analyzed. As a result of fermented *L. edodes* by phytolactic acid bacteria, optimal fermentation proceeded in *Lactobacillus acidophilus* and *Pediococcus pentosaceus.* Fermented *L. edodes* have a higher content of useful ingredients than before fermentation, so it is expected to be useful as a plant food material for vegetarian.

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P4-63

Evaluation of anti-microbial and anti-inflammatory activities of isolated lactic acid bacteria from agricultural crops on potential vaginal dysbiosis improvement

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Bacterial Vaginosis (BV), recurring vaginal infection, is occurred by dysbiosis in vaginal microbiome between Lactic Acid Bacteria (LAB) and anaerobic bacteria such as *Gardnerella vaginalis.* This study aims to select a new promising vaginal probiotic strain that has antimicrobial and anti-inflammatory activities to maintain balanced vaginal microbiome. Seventy three strains were isolated from three crops (*Centella asiatica, Panax ginseng, Perilla frutescens*) and identified as LAB by 16S rRNA sequencing. With these isolates, Lactic acid and H_2O_2 production abilities will be initially tested in order to select probiotic candidates that can reduce pathogenic bacteria in vagina effectively. Next, Antimicrobial test will be performed against vaginal anaerobic pathogen (*G. vaginalis*). Additionally, we are going to check if the selected isolates might reduce Nitric Oxide production in LPS-induced RAW 264.7 cell line. Lastly, in order to show anti-inflammation activity of the strains, pro-inflammatory cytokine levels will be measured in vaginal epithelial cell (ATCC PCS-480-010) co-culture model after treatment with the isolates. With these procedures, we expect potential vaginal probiotic strains could be successfully selected and these strains can be used to improve vaginal health.

P4-64

Evaluation of antioxidant and nitrite scavenging activity using lactic acid bacteria metabolites isolated from ginseng sprout

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Postbiotics can improve cancer treatment and related disorders by producing metabolites and short-chain fatty acids (SCFAs) in the gastrointestinal tract. This study aims to screen probiotics from Ginseng Sprouts and then evaluate the anti-carcinogenic effect of postbiotics through analyzing an antioxidant property, nitrite scavenging activity, anti-inflammatory effect, and immunomodulatory attributes. In this study, we isolated and screened lactic acid bacteria from Ginseng Sprouts through BCP test, Catalase test, Gram staining, and 16s rRNA sequencing and will characterize them as probiotics through 0.3% bile tolerance test & acid tolerance test. After evaluation of resistance to gastric acidity and bile salt, we will produce different metabolites and SCFAs through fermentation in laboratory growth media. As postbiotics can have beneficial effect on gut microbiota, we expect that we can produce different metabolites through fermentation from our isolates and these metabolites might stimulate anti-carcinogenic property through antioxidant effect, nitrite scavenging activity, anti-inflammatory activity, and immunomodulatory effect.

P4-65

Evaluation of preventing inflammatory bowel disease and dysbiosis of gut microbiota with probiotics in DSS-induced colitis mouse model

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This study aims to isolate Lactic Acid Bacteria (from *Ginseng, Centella asiatica* and *Perilla frutescens*), characterize them as probiotics by evaluating safety in the gastrointestinal tract, performing antibacterial resistance against *Escherichia coli, Salmonella typhi* and then will analyze anti-inflammatory effects in mouse model of DSS-induced colitis. In this study we isolated twenty seven strains (5 species) isolated from three crops. Safety assessment in the gastrointestinal tract will be measured through hemolytic activity, antibiotic resistance and BSH activity. After safety assessment, we will measure the antibacterial activity of the strain against Proteobacteria which accounts for a high percentage of dysbiosis. Finally, two selected isolates (*Lactobacillus pentosus, Leuconostoc lactis*) will be orally administered to mice fed DSS to induce colitis and their protection abilities against intestinal inflammation will be analyzed by measuring intestinal histological changes, the levels of pro-inflammatory cytokines and anti-inflammatory cytokines. Through these experiments, we expect that our selected probiotic strains can be recognized as safe as probiotics, and it is expected to be effective in improving DSS colitis in mouse by resolving dysbiosis and regulating intestinal microflora and immune responses.

P4-66

Isolation and characteristics of *P. nalgiovense* SJ02 obtained from korean mudflat for fermented sausage

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In recent years, as the Korean consumer demand for Charcuterie such as fermented sausage increases, more commercial starter have been imported for processing meat. *Penicillium nalgiovense is* the only fungal starter which is approved by the Ministry of Food and Drug Safety(MDFS) and provided beneficial effects for the ripening of the dry fermented sausages including Salami for the development of specific flavour features. However, due to the monopoly of a foreign company since it has not been developed as a domestic fungal starter, the use of *P. nalgiovense* in Korea has to depend on imports. The aim of this study was to isolate the Korean fungal starter, *P. nalgiovense* species, and to evaluate its properties to develop the fungal starter for processing dry fermented sausage. In this study, 72 fungal strains were isolated from the Nuruk, a traditional Korean fermentation starter, salted seafood, and the mudflat in Seondo-ri. Among them, 24 strains were identified as *Penicillium.* Morphological analysis, ITS sequencing, and PCR were performed to identify *P. nalgiovense* isolates. *"Penicillium nalgiovense* SJ02" was used for characterizing the potential fungal starter for fermented sausages such as enzyme activity, growth rate, and production of mycotoxin by comparing with commercial mold starter(Mold600, Christian Hansen, Denmark). Our results suggest that *P. nalgiovense* SJ02 showed high proteolytic activity, lipolytic activity, growth rate, and successful process of the fermented sausage comparable to the control starter, Mold600, and is expected to replace imported commercial strain.

포스터 발표 논문 초록 PART Ⅴ

생리활성/영양/기능성 분야

POSTER NO. P5-1~P5-50

P5-1

Enzymatic preparation and antioxidant activities of protein hydrolysates from tuna by-products.

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The present study was carried out to evaluate the tuna by-products as a health functional food material in order to contribute to health functional food industry and the recycling of fishery by-product. Protein hydrolysates were prepared from tuna by-products (TP) by enzymatic hydrolysis using five different proteases (alcalase, bromelain, flavourzyme, neutrase, and papain), and the hydrolysates were then tested for their antioxidant activities. Based on available amino group contents and sodium dodecyl sulphate-polyacrylamide gel electrophoresis analysis, TP treated with all enzymes except papain showed a high degree of hydrolysis. According to the RC50 values of the protein hydrolysates obtained from two different antioxidant analysis, the enzyme group had significantly higher antioxidant activity than the no-enzyme group. However, in the hydrogen peroxide radical scavenging activities, the flavourzyme group had significantly high level of antioxidant activity than other enzyme groups. In addition, TP hydrolysates were further tested for their inhibitory effects on peroxidation of linoleic acid and 2-deoxy-D-ribose by measuring thiobarbituric acid values, and the results show that the inhibition rate increased as the concentration of TP hydrolysates increased.

P5-2

A systems biological approach to understanding the mechanisms underlying the therapeutic potential of mugwort and ginger supplements

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Mugwort and Ginger has been widely used in health-promoting supplements in Asia and is becoming increasingly popular in Western countries. However, its

therapeutic mechanisms against most diseases have not been clearly elucidated. The aim of the present study was to provide the biological mechanisms of Mugwort and Ginger against various diseases. We used a systems biological approach to comprehensively identify the component-phenotype in order to explore the mechanisms underlying the therapeutic potential of Mugwort and Ginger against many diseases. The compound combination-oriented natural product database with unified terminology (COCONUT) database has been constructed to retrieve the name of herbs by scientific name. When *Artemisia princeps* Pampanini was searched, 54 kinds of compounds were identified. Of the 54 components of Mugwort, 21 components were linked with 2,998 phenotype. Eupailin and jacetosidin, known as active compounds in Mugwort, were linked with atherosclerosis. In terms of Ginger, When *Zingiber officinale* R. was searched, 2,100 kinds of compounds were identified. Of the 2,100 components of Ginger, 569 components were linked with 5,944 phenotype. 6-Shogaol, gingerol and zingerone, known as active compounds in Ginger, were linked with inflammatory bowel disease, ulcerative colitis, crohn's disease. These results support the mechanisms underlying the efficiency of Mugwort and Ginger for many diseases, such as thrombosis and colitis.

P5-3

Folic acid and vitamin c content of korea' s food according to processing pethod

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The National Standard Food Component Statement is utilized for the establishment and implementation of policies, including the regulation of supply and demand of food, evaluation of Korean nutrition status through the national health nutrition survey, and establishment of standards for nutrition, preparation of group diets, development of nutrition management programs for export agricultural products, and recently its scope has been expanded to include use in smart appliances and individual nutrition areas. Currently, it is necessary to update data reflecting changes in food consumption trends due to the diversification of simple meals and mini fruit vegetables due to the increase of single-person households, and the increase in the cultivation of crops introduced outside the country. This study raises the self-sufficiency rate of

data and performs a component analysis on new foods for revision of the National Standard Food Component Statement, and analyzes the components of vitamin C and folic acid for korea's food(68 articles) according to processing method of this presentation

P5-4

Antioxidant activity and anti-Inflammatory on caco-2 cell line effects of ethanol extract from *Cheonggukjanghwan* with blueberry and aronia fermented

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This study evaluated the antioxidant activity (DPPH radical scavenging activity and SOD-like activity) and anti-inflammatory on Caco-2 cell line effects of ethanol extract from *Cheonggukjanghwan* with blueberry and Aronia fermented. DPPH radical scavenging activity (IC_{50}) and SOD-like activity (IC_{50}) were 4.70 and 4.82, respectively. The anti-inflammatory evaluation was performed using Caco-2 cell, ability to inhibit nitric oxide (NO) production and inhibit the production of reactive oxygen species (ROS) was confirmed in the concentration group showing more than 80% cell viability. Caco-2 cell line induced an inflammatory response with lipopolysaccharide (LPS, 1 μg/mL), and showed a NO production inhibitory ability of 3.12~31.18% compared to the LPS treatment group at the concentration of 0.1~0.4 mg/mL of ethanol extract from *Cheonggukjanghwan.* In addition, the ability to inhibit ROS was confirmed to be 9.25 to 45.43% compared to the LPS treatment group at the 0.1-0.4 mg/mL ethanol extract from *Cheonggukjanghwan.* Therefore, the antioxidant and anti-inflammatory effects of ethanol extract from *Cheonggukjanghwan* with blueberry and Aronia fermented showed a concentration-dependently significant effect on the Caco-2 cell line.

P5-5

Effect of beneficial bacteria and hazardous substances on the functionality of traditional *Soy sauce*

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This study was conducted to determine the effect of the content of beneficial bacteria and harmful components on the functionality of domestic traditional fermented soy sauce. The traditional fermented soy sauce(TMK21-12, TCK21-6, TCK21-39, TFK21-1, TMK21-10, TCK21-34, TCK21-38, and TCK21-48) was freeze-dried and extracted using 80% ethanol, and evaluated for functionality. Among antioxidant activities, DPPH radical scavenging activity increased in concentration-dependently, and the highest concentration, 10 mg/mL, showed an activity of 21.74~84.38%. Oxygen radical absorbance capacity (ORAC) was expressed as mg Trolox equivalent (mg TEAC/g) and was analyzed to be 21.87~46.81 mg TEAC/g. The anti-diabetic activity (α-glucosidase inhibition), anti-obesity activity (pancreatic lipase inhibition) and anti-dementia activity (acetylcholine esterase inhibition) were 4.29~15.29%, 16.33~36.94% and 8.61~18.75% at 10 mg/mL, respectively. The IC50 of anti-hyperlipidemic activity (angiotensin-converting enzyme1 inhibition) was 0.55~12.28 mg/mL. The TCK21-39 had high antioxidant activity, anti-obesity activity, and anti-dementia activity, and TFK21-1 and TCK21-48 had high anti-diabetic activity and anti-hyperlipidemic activity, respectively. These results confirmed that the difference in the content of beneficial bacteria and hazardous substances contained in the traditional fermented soy sauce did not propose a significant difference in that functionality.

P5-6

Antioxidant activity and anti-Inflammatory effect of ethanol extract from *Deonjang* stock with *Perilla Frutescens* leaf

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This study evaluated the antioxidant activity (DPPH radical scavenging activity and SOD-like activity) and anti-inflammatory on Raw 264.7 cell line effects of

ethanol extract from *Deonjang* stock with *Perilla frutescens* leaf. DPPH radical scavenging activity (IC_{50}) and SOD-like activity (IC_{50}) were 6.49 and 4.72, respectively. The anti-inflammatory evaluation was performed using Raw 264.7 cell, ability to inhibit nitric oxide (NO) production, the production of reactive oxygen species (ROS) and the production of cytokines (TNF-α and IL-1β) was confirmed in the concentration group showing more than 80% cell viability. Raw 264.7 cell line induced an inflammatory response with lipopolysaccharide (LPS, 1 μg/mL), and NO and ROS production inhibitory ability showed 14.57 and 39.94% in the highest treatment group compared to the non-treatment group of ethanol extract from *Deonjang* stock. In addition, the ability to inhibit TNF-α and IL-1β was confirmed 11.18% and 69.71% compared in the highest treatment group compared to the non-treatment group of ethanol extract from *Deonjang* stock. Therefore, the antioxidant and anti-inflammatory effects of ethanol extract from *Deonjang* with *Perilla frutescens* leaf showed a concentration-dependently significant effect on the Raw 264.7 cell.

P5-7

Analysis of antioxidant activity of functional enhanced silkworm

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Silkworm food has been found to be effective for dementia, liver function, lowering blood sugar, and possesses antioxidant properties, which has been attracting attention as a health functional food. In this study, methods for enhancing the functionality of silkworms were explored and the production potential of high-functional silkworms was analyzed. For enhancing antioxidant activity, ascorbic acid, caffeic acid, laminarin, and glutathione were injected or fed to 5th instar silkworms, and the antioxidant activity of silkworm extract was comparatively analyzed. There was no significant change in polyphenol and flavonoid content, but it was confirmed that 2,2-diphenyl-1-picrylhydrazyl radical scavenging ability, superoxide dismutase-like activity, and reducing power were slightly increased after injection of ascorbic acid, caffeic acid, and glutathione. To confirm the increase in antioxidant efficacy through feeding, an inducer was mixed with sucrose and sprayed on mulberry leaves. As a result, the growth rate of silkworms improved and all indicators of antioxidant activity were improved in silkworms fed with ascorbic acid and glutathione. Considering

these results, producing high-functional silkworms was deemed possible.

P5-8

Nutritional compositions in roots, twigs, leaves, fruit pulp, and seeds from pawpaw (*Asimina triloba* [L.] Dunal) grown in korea

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Pawpaw (*Asimina triloba* L.) roots, twigs, leaves, fruit, and seeds were analyzed for their nutritional compositions. Seeds exhibited significantly higher levels of crude protein, lipid, fiber, and dietary fiber than those of the other parts. Sucrose in fruit was 9321.24 mg%, which was the highest among the samples. The total essential amino acid to total amino acid ratio was highest in the leaves, and the leaves contained the highest amount of potassium. The calcium content ranged between 8.15-153.41 mg%. Oleic and linoleic acids in seeds were 5905.11 and 8045.56 mg%, respectively, which were the highest among the pawpaw parts. The highest amount of linolenic acid was measured in the leaves, and β-carotene, vitamin C, and vitamin E were also the most abundant in the leaves. These results suggest that every part of pawpaw is a good source of an important food item. Additionally, this study provides basic data for improving the sitological value of pawpaw.

P5-9

Anti-inflammatory effects of *Marclura tricuspidata* twig sawdust extract fermented with *Ganoderma lucidum* mycelium in 3T3-L1 adipocyte

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The present study aimed to determine the anti-inflammatory effect of extract from *Marclura tricuspidata* twig sawdust fermented with *Ganoderma lucidum* mycelium(MTGLE) on lipopolysaccharide (LPS)-induced adipocytes inflammation in 3T3-L1 adipocytes. Differentiated 3T3-L1 adipocytes were incubated with MTGLE followed by LPS treatment. The secretion of tumor necrosis factor-α

(TNF-α), interleukin-6 (IL-6) and monocyte chemoattractant protein-1 (MCP-1) were measured using ELISA. The expression of toll-like receptor 4 (TLR4), myeloid differentiation primary response 88 (MyD88) and tumor necrosis factor receptor-associated factor 6 (TRAF6) were measured by western blotting. The results showed that CFV dose-dependently inhibited LPS-induced TNF-α, IL-6 and MCP-1 production in the adipocytes. CFV inhibited LPS-induced expression of TLR4, MyD88, and TRAF6. These results indicated that CFV inhibits the LPS-induced inflammatory response in adipocytes by inhibiting TLR4 signaling,

Keywords: *Marclura tricuspidata* twig sawdust; *Ganoderma lucidum* mycelium; adipocytes; inflammation; obesity

P5-10

Anti-oxidant and anti-inflammatory activities of *Mesembryanthemum crystallinum* extract

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We studied the anti-oxidant activity and anti-inflammatory effects *of Mesembryanthemum crystallinum* extract(MCE). The MCE was prepared using ethanol. To investigate the anti-oxidant activity, we evaluated for DPPH(1,1-diphenyl-2-picrylhydrazyl) free-radical scavenging activity, reducing power, polyphenol and flavonoid contents and MCE showed a concentration-dependent effect in all assays. To investigate the anti-inflammatory activity, we used RAW 264.7 cells. MCE did not show cytotoxicity. CTN inhibited inflammation as seen by reduced levels of NO, IL-1β, TNF-α and PGE2 compared to lipopolysaccharide(LPS). MCE also suppressed the expression of the following genes: COX-2, iNOS2 and PGE_2 compared to LPS. These results demonstrated that MCE has antioxidant and anti-inflammatory activities and can therefore be used as a natural biological resource for functional food.

Keywords: anti-inflammation, anti-oxidant, *Mesembryanthemum crystallinum,* lipopolysaccharide, functional food

P5-11

Effects of *Allium ampeloprasum* extract on testosterone synthesis in TM3 Leydig cells

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This study investigated the effects of Allium ampeloprasum extract(AME) on testosterone synthesis in TM3 leydig cells under hydrogen peroxide(H_2O_2)-induced oxidative stress. When the cells were treated with H_2O_2, AME showed no increment of cell proliferation. Testosterone level was decreased when the cells were treated by H2O2, but it was increased in the presence of AME. In order to find out the effect of AME on the testosterone biosynthetic pathway, we examined the expression of the genes involved in the synthesis or degradation of testosterone. The gene expression levels of CYP11A1, 3β-HSD2 and 17β-HSD3 which are involved in testosterone synthesis were decreased by H_2O_2 but were increased by AME treatment. Furthermore, 5α-reductase2 and aromatase which are involved in testosterone degradation were increased by H_2O_2 but were decreased by AME treatment. In conclusion, AME increased testosterone level through increasing the expression of testosterone synthetase and decreasing the expression of testosterone converting enzyme in TM3 leydig cells under H_2O_2-induced oxidative stress. These results indicated that AME was able to alleviated andropause syndrome by restoration of testosterone.

Keywords: Allium ampeloprasum, andropause, testosterone, oxidative stress, TM3 leydig cells

P5-12

Antioxidant, anti-fibrin clotting, and anti-coagulant effect of *Maclura tricuspidata* (Carr.) bur extracts fermented using several forest mushrooms

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The present study was investigated on antioxidant, anti-fibrin clot formation, and anti-coagulant effect of *Maclura tricuspidata* (Carr.) Bur extracts fermented using several forest mushrooms (*Fomitopsis pinicola, Phellinus baumii, Ganoderma lucidum, Armillaria mellea, Pleurotus ostreatus, and Grifola frondosa*). The antioxidant effect of the extracts was investigated by total polyphenol, flavonoid contents, and radical or nitrite scavenging activity. The

anti-fibrin clot formation effect of the extracts was investigated by fibrin clot assay, and the anti-coagulant effect was tested by recalcification time assay, APTT, and PT assay. The polyphenolic and flavonoids contents were confirmed in the extracts fermented using several forest mushrooms. The extracts have the DPPH radical and nitrite scavenging activity, inhibition of fibrin clot formation, and coagulation activity. These results indicate that *M. tricuspidata* (Carr.) Bur extracts fermented using forest mushrooms might be strong candidates as a natural material for cardiovascular disease and blood circulation.

P5-13

Intestinal immune-modulating activities of oak *Lentinus edodes* Fermented using *Lactobacillus acidophilus* JMIL-001, *Pediococcus pentosaceus* JMIL-002, *Lactobacillus fermentum* JMIL-003, and *Lactobacillus plantarum* ICFPL-001

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The present study was investigated on intestinal immune-modulating activities *in vivo* of oak *Lentinus edodes* fermented using several lactic acid bacterias (*Lactobacillus acidophilus* JMIL-001, *Pediococcus pentosaceus* JMIL-002, *Lactobacillus fermentum* JMIL-003, and *Lactobacillus plantarum* ICFPL-001). To investigate the intestinal immune-modulating activities, alterations of body weight, tissue weight, serum trypsin inhibitor, serum elastase, β-glucuronidase activity, cytokine level in the experimental, and control groups in rodent. The levels of trypsin inhibitor, elastase, β-glucuronidase, and TNF-α were reduced through administration of oak *Lentinus edodes* fermented using several lactic acid bacterias. These results show that oak *Lentinus edodes* fermented using several lactic acid bacterias may be good natural food source and functional material for intestinal immune health.

P5-14

에탄올 농도별 커피 추출물의 기능성 탐색

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본 연구는 기능성 탐색을 위하여 에탄올 농도별(0~100%, v/v) 커피 추출물의 이화학적 특성과 품질 특성을 평가하였다. 원두의 일반성분(수분, 조회분, 조단백, 조섬유 및 조지방)은 각각 11.80 %, 3.45%, 12.23%, 22.51% 및 14.13%이었다. 에탄올 추출물의 당도, pH, 및 총산도는 각각 2.90~19.60 °Brix, 4.49~5.92 및 0.09~0.18%이었으며 색도(L*, a* 및 b*)는 각각 17.10~22.55, -0.50~2.30 및 1.34~6.31이었다. 에탄올 추출물의 ABTS(2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid))와 DPPH(2,2-diphenyl-1-picrylhydrazyl) radical scavenging activity의 IC_{50}은 각각 3.14~100.40 μg/g, 7.50~116.81 μg/g이었고, 50% 에탄올 추출물에서 가장 높게 나타났으며 CUPRAC(cupric ion reducing antioxidant capacity, 12.24~181.52 mg TE/g)에서도 유사한 경향이었다. 한편 에탄올 추출물의 TPC(total polyphenol content) 및 total chlorogenic acid 함량은 각각 5.48~41.56 mg GAE/g, 3.40~13.17 mg/g으로 50% 에탄올 추출물에서 가장 높게 나타났으나 caffeine 함량은 3.47~11.96 mg/g으로 에탄올 농도가 증가함에 따라 함량이 증가하였다. 에탄올 추출물의 항균 활성은 *Bacillus cereus*에서 저해환 면적이 10.06~13.25 mm으로 50% 에탄올 추출물에서 가장 넓은 저해환 면적을 보였으나 *Listeria monocytogenes*와 *Salmonella typhimurium*에서 저해환이 나타나지 않았다. 본 연구 결과를 통해 에탄올 추출물의 기능성 탐색에 적합한 에탄올 농도는 50%(v/v)로 나타났다.

P5-15

Phytochemical profile of *Xanthium Strumarium* L. fruit extract and its antioxidant and anti-inflammatory activities

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Xanthium strumarium L. (XS) has been traditionally used as an herbal medicine to treat nasal sinusitis, headache, and arthritis due to its bioactive compounds. The aim of this study is to analyze composition of fatty acids, phenolic acids, and phytosterols in XS fruit extract from Korea (XS-K) and China (XS-C). Afterwards, the anti-oxidant and anti-inflammatory effects were compared with XS-K and XS-C. Irrespective of similar fatty acid composition,

XS-C provided much higher total fatty acid content than XS-K. Chlorogenic acid and β-sitosterol are the main phenolic acid and phytosterol, respectively, in both XS-K and XS-C. However, xanthatin was detected only in XS fruit from Korea. In addition, XS-K had higher total phenolic and flavonoid contents, resulting in significantly higher antioxidant activity than XS-C based on comparative methods of DPPH, ABTS, FRAP as well as total antioxidant capacity. Treatment with both XS-K and XS-C extracts suppressed mRNA level of UV-induced cyclooxygenase-2 in human dermal cells. Collectively, our findings support that XS fruit extract could be a potential phytomedicine agent by improving its anti-oxidant and anti-inflammatory activities.

P5-16

Antioxidant and anti-aging activity of *Ge-Geol* radish water extracts

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Ge-geol radish, is a variety of white radish. It is a round, pungent radish with a thick rind and firm flesh that does not get soft even after a few years of storage as kimchi. Being a speciality crop of Icheon and Yeoju in Korea, an international catalogue of endangered heritage foods.

In this study, it is evaluated that the physiological activities of extracts from *Ge-Geol* radish by the method of reflux water extraction with for the purpose of developments of drugs, functional beauty foods and cosmetics materials. The contents of polyphenol and flavonoid were 120.13 mg/g and 5.90 mg/g, respectively. The soluble protein and reducing sugar were 458.13 mg/g and 117.13 mg/g, respectively. In the results of electron donating ability and ABTS radical cation scavenging activity, the activities at the condition of 2,000 ug/mL concentration were highest as 92.13% and 88.46%, respectively. The superoxide dismutase (SOD)-like activity showed the highest activity of 19.50% in the 2,000 ug/mL concentration. In the measurement of tyrosinase and collagenase inhibitory activity, the effects of 67.47% and 42.91% were shown at 2,000 ug/mL, respectively. These result verified that the extract extracted from *Ge-Geol* radish by the method of reflux ethanol extraction have a strong antioxidant activity and it can be used as an effective antioxidant substance for nutraceutical food and medicine.

P5-17

Physiological activity of *Nelumbo nucifera* byproducts mixed extract

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Nelumbo nucifera is a large aquatic herb widely found in the native of India, China, Japan and Korea. Traditional medicinal systems advocate several different therapeutic effects including antitumor, antiangiogenic, antiobesity, and antioxidant properties of this herb.

In the present study, we compared and measured physiological activity of pressure heating water extraction from *Nelumbo nucifera* shoots, leaves, seedpod mixed(ME1, 1:1:1, ME2, 1:1:2). The contents of polyphenol compounds of ME1 was 114.33 mg/g and ME2 was 106.31 mg/g. The contents of flavonoid compound of ME1 was 259.01 mg/g, and ME2 was 228.84 mg/g. The contents of soluble protein and reducing sugar were 240.02 mg/g and 168.32 mg/g, respectively at ME1, 233.56 mg/g and 122.59 mg/g, respectively at ME2. In the measurement of the radical scavenging of ABTS and DPPH, ME1 showed the highest scavenging rates of 93.28% and 97.69%, respectively at a concentration of 2,000 ug/mL, Also ME2 showed the highest scavenging rates of 93.39% and 98.81%, respectively. Therefore, it can be concluded that Nelumbo nucifera shoots, leaves, seedpod mixture, have the potential to be used as functional ingredient for skin health and beauty food.

P5-18

Physiological activities of hot water extract from *Phragmites communis* rhizoma as a functional materials

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The rhizomes of reeds, *Phragmites communis* Trinius, that live in swamps are called “Nogeun(蘆根)” in oriental traditional medicine and have been used as a treatment for esophageal cancer, vomiting, lung abscess, tetrodotoxin poisoning, remove of fever, diuresis and skin beautifier. The present study was performed to investigate the physiological activities of hot water extracts using pressure

heating extractor from *P. communis* rhizoma (PRHW). The total flavonoid and polyphenol contents of the PRHW were 2.38 mg/g and 45.60 mg/g, respectively. The soluble protein and reducing sugar were 242.75 mg/g and 98.276 mg/g, respectively. The DPPH radical scavenging ability showed 90.51% and ABTS radical scavenging rate of 76.81% at 1.0 mg/mL concentration. The nitrite scavenging abilities of pH 1.2 and 3.0 condition at 2.0 mg/mL were 56.43% and 34.46%, respectively. Tyrosinase inhibition activities for whitening effect of PRHW was 49.96% at concentration of 2.0 mg/mL. In the analysis of anti-wrinkle effect, the collagenase and elastase inhibition effects showed the 29.63% and 6.19% respectively at 2.0 mg/mL. These results indicated that *P. communis* rhizomes can be used as functional biomaterial for a development of healthy food materials and cosmeceutical beauty food stuffs with antioxidant and anti-aging activity.

P5-19

A study on the physiological activity of smilacis rhizoma extracts

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Tobokryeong (土茯苓, Smilacis Rhizoma) is a root rhizome of *Smilax china* L., which has detoxifies and removes moisture from the body, and is a herbal medicine used for the treatment of joint and inflammatory diseases and skin diseases. The young leaves and fruits are edible, and the large leaves are used as a natural preservative for preserving rice cakes in summer. Smilacis Rhizoma were extracted with water (SRW) and 70% ethanol (SRE) as a solvent using reflex extractor, and hot water extract using high-pressure extractor (SRHW). The water-soluble protein and reducing sugar were 313.80～353.99 mg/g and 24.76～30.36 mg/g, respectively. The total flavonoid compound contents was the highest at 6.19 ug/mL in SRE, and total polyphenol compound content was the highest in SRHW with 230.57～291.58 mg/g. In the measurement of nitrite scavenging effect, SRHW was the highest scavenging effect at 96.21% in the concentration 2.0 mg/mL of pH 1.2. As a result of measuring the ABTS radical scavenging activity of SRHW was 98.14% at 0.25 mg/mL, which was similar to that of L-ascorbic acid (98.32%). At 0.5 mg/mL, all extracts were more than 90%, and at 1.0 mg/mL, more than 95% activity. The DPPH radical scavenging

activity were 81.06~96.04% at a concentration of 2.0 mg/mL, and SRE showed the best radical scavenging rate. As a result, Smilacis Rhizoma, the root of *Smilax china* used for food and medicinal purposes, had a high content of water-soluble protein and polyphenol compound contents. In addition, it was confirmed that the nitrite scavenging rate and the radical scavenging ability were excellent, and thus had an antioxidant effect. Therefore, it is judged that Smilacis Rhizoma can be used as a functional material in the health food and beauty industries.

P5-20

Cibotii rhizoma extract attenuates dexamethasone-induced muscle atrophy by regulating the protein turnover in C2C12 cells

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Sarcopenia is an age-related disease which is characterized by decreased in muscle mass, strength, and function. Dysregulation of protein turnover, a balance between protein synthesis and degradation, leads to muscle atrophy indicated by contraction of muscle fibers and a decrease in cross-sectional area of muscle. Cibotii Rhizoma, the dried rhizome of *Cibotium barometz* J. Smith (C. barometz), has long been used to treat bone or nervous system disorders. However, its role in skeletal muscle has not yet been reported In this study, the preventive effect of Cibotii rhizoma extract (CRE) on dexamethasone (Dex)-induced muscle atrophy was studied in C2C12 myotubes. CRE increased the expression of protein related to myogenic differentiation such as myogenin, and myosin heavy chain (MHC). Additionally, CRE recovered DEX-deteriorated the Akt/mammalian target of rapamycin (mTOR) pathway which is involved in protein synthesis. Conversely, CRE reduced the protein degradation related genes, muscle RING-finger protein-1 (MuRF1) which are generated by nuclear translocation of forkhead box O3 (FoxO3). Furthermore, when bioactive components of CRE were analyzed by HPLC-DAD system, protocatechuic acid, catechin, p-coumaric acid, chlorogenic acid, caffeic acid, and ferulic acid were identified. These results suggest that CRE reduces protein degradation and increases protein synthesis in the muscle, thus contributing to the amelioration of Dex-induced muscle atrophy. Thus, CRE may be a potential candidate for the prevention and treatment of muscle atrophy.

P5-21

Ameliorative effects of fermented garlic on autoimmune neurodegenerative disease in cuprizone-induced rat model of multiple sclerosis

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Garlic is composed of a wide variety of components giving it its range of health benefits working together synergistically, including neuroprotective, antioxidant, immunomodulatory activities etc., which are attributed to its therapeutic potential. This study aimed to evaluate the effects of fermented garlic on multiple sclerosis (MS) in a cuprizone-induced rat model. The rats were divided into five groups: CON, CPZ, DMF, GE and FGE where Except the CON, all other groups received 0.4 % cuprizone in the AIN 93G diet, and the CON and CPZ, DMF, GE, and FGE group received oral treatment of saline, 15 mg/kg dimethyl fumarate, 5.2 g/kg equivalent fresh garlic extract, 5.2 g/kg equivalent fermented garlic extract, respectively for five weeks. Cuprizone had a substantial effect on short-term memory and motor coordination, as assessed by the Y-maze and rotarod experiments, respectively; however, administration of fermented garlic extract enhanced the condition compared to the CPZ group and outperformed the DMF and GE groups where DMF is a US FDA-approved oral first-line treatment for MS. In addition, cuprizone induced oxidative and nitroxidative stress, demyelination, glial activation and pro-inflammation were significantly improved in FGE compared to DMF and GE. This study indicates underlying neuroprotective effects of fermented garlic, which may help against neurodegenerative disease.

P5-22

Effects of fermented onion on gut health in d-galactose-induced aging rats

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Onion is rich in antioxidants including quercetin, which is present mostly in glycoside form and is not absorbed well in the body. In addition, onion contains

a large amount of FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols), which may not be good for the gut. Fermentation of onion may reduce these problems. Onion is fermented using a lactic acid bacteria, *Lactobacillus casei.* Then fermented onion was evaluated for the effect on gut health in D-galactose-induced aging rat. Rats were divided into five groups. The following oral treatments were administered to rats for 12 weeks: Control (saline), CD (Control D-galactose, saline), OE (Onion Extract, 20,000 mg/kg rat), FOE (Fermented Onion Extract, 20,000 mg/kg rat), and MFO (Milk thistle Extract with Fermented Onion Extract, each 10,000 mg/kg rat). An aliquot of D-galactose solution (150 mg/kg rat/day) was injected intraperitoneally into all rats, excluding the control. Compared to CD and OE groups, FOE and MFO groups showed improvements in colonic histomorphology, immunity, oxidative stress, SCFAs, and biochemical analyses of the gut in which, aging was induced by D-galactose. These results suggest that consumption of a fermented onion, especially when combined with milk thistle, can improve the gut health of the elderly.

P5-23

Antitussive, expectorant activities and anti-inflammatory effects of *Dendropanax morbifera* leaf extract

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Dendropanax morbifera is commonly used as a traditional medicine for the treatment of several diseases, such as headache, dysmenorrheal, infectious diseases, skin diseases and malady in Korea and distributes in the southern part of Korea. However, its antitussive, expectorant activity have not been studied systematically. In the present study, we examined the expectorant, antitussive, and anti-inflammatory activities of the water extracts of *D. morbifera* leaf (DML), and the five fraction divided into hexane Fr, chloroform Fr, ethyl acetate Fr, buthanol Fr, and water Fr. from DML. They were orally administrated to the SD rats to investigate expectorant activities by a tracheal phenol red secretion method. Treatment of DML (50, 100, and 200 mg/kg) significantly enhanced the amount of phenol red secretion, increased the latent period and decreased the frequency of coughs in ammonia-induced mice. Also

DML reduced the production of NO, pro-inflammatory cytokines, including tumor necrosis factor-, interleukin (IL)-1, and IL-6 in BALF, and reduced the volume of carrageenan-induced paw edema in rats. Furthermore, DML Among the fraction, chloroform Fr at 50 mg/kg is the most effective fraction in expectorant activity by a tracheal phenol red secretion method, and antitussive activities. The chloroform fraction (50 ug/mL) also inhibited NO, pro-inflammatory cytokines, such as tumor necrosis factor-, interleukin (IL)-1, and IL-6 in BALF. The leaf of *Dendropanax morbifera* Leveille has significant expectorant, antitussive and anti-inflammatory effects. *Dendropanax morbifera* Leveille could be potential source for development of new antitussive, expectorant activities and anti-inflammatory drug.

P5-24

Antiobesity and hepatoprotective effects of protein hydrolysates from *Protaetia brevitarsis* in high-Fat diet-Induced obese mice

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Obesity can cause fatty liver which leads to hepatic dysfunction and local/systemic inflammatory responses. The aim of the present study is to investigate the antiobesity and hepatoprotective effects of protein hydrolysates from *Protaectia brevitas* (PHPB) in high-fat diet-induced obese mice. The body weight and the weight of liver and epididymal fat tissues were significantly decreased in the PHPB-treated group compared with those in the high-fat control group. In addition, the levels of serum ALT, ALP, IL-6, and TNF-α were significantly reduced in the PHPB-treated group. Further histopathological analysis revealed that the PHPB-treated group also showed significantly reduced macrovesicular fatty change and inflammatory cell infiltration in the liver. Overall, the results of this study suggest that PHPB represents a potential source of nutraceuticals for improving obesity and obesity-related hepatic inflammation.

P5-25

In vivo protective effects of lentil (*Lens culinaris*) extract against oxidative stress-Induced hepatotoxicity

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Excessive oxidative stress plays a role in hepatotoxicity and the pathogenesis of hepatic diseases. In our previous study, pretreatment with the phenolic extract of beluga lentil (BLE) significantly preserved the viability of H2O2-treated AML12 hepatocytes by reducing intracellular reactive oxygen species (ROS) levels; thus, we hypothesized that BLE might show protective effects against CCl4-induced acute liver injury in mice. As a result of in vivo study, pretreatment with BLE (400 mg/kg) for 2 weeks significantly reduced serum levels of alanine transaminase and triglyceride by about 49% and 40%, respectively, and increased the expression and activity of hepatic glutathione peroxidase in CCl4-treated BALB/c mice. This is the first study to demonstrate the hepatoprotective effects of beluga lentil and their underlying mechanisms in a mouse model, and these results suggest that beluga lentil represents a potential source of natural hepatoprotective agents.

P5-26

Changes in antioxidant activities according to laver heat processing

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This study was to compare the antioxidant activities of *Pyropia dentata* harvested in November, December and *Pyropia yezonsis* harvested in January, March according to freeze dried, dried and roated processing. The total phenolic compound contents(tannic acid equivalent/g) was lower in laver than those in the other samples. The total phenolic compound contents is increased in order of roated laver>Dried laver>Freeze-dried laver. Likewise, ABTS+ (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) radical-scavenging and ferric reducing antioxidant activities increased during heat treatment processing. This results provide basic information regarding the antioxidant activities of laver according to heat treatment processing and may be used to develop various processed food and health functional food.

Key words : *Pyropia dentata, Pyropia yezonsis,* Antioxidant Activities

P5-27

구기자, 산수유, 야관문, 엉겅퀴 및 어성초의 항산화활성 및 항혈전활성

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약용식물의 phytochemicals 성분들은 지질 과산화 및 lipoxygenase 억제, 혈행개선, 면역기능 촉진 등의 다양한 유용 생리활성과 연관되어 있다. 본 연구에서는 구기자 열매 (LCM-F), 산수유 열매 (COS-F), 야관문 잎 (LCE-L), 엉겅퀴 뿌리 (CJ-R) 및 어성초 잎 (HC-L)를 이용한 복합 기능성 음료제품을 개발하기 위해, 상기 5종의 ethanol 추출물과 이들의 hexane, ethylacetate, buthanol 분획물과 water residue을 조제하고 각각의 항산화 및 항혈전 활성을 평가하였다. 25종의 시료 중, 가장 강력한 DPPH 음이온 소거능은 COS-F의 ethylacetate (EA) 분획물에서, 가장 강력한 ABTS 양이온 소거능, nitrite 소거능 및 환원력은 HC-L의 EA 분획물에서 확인되었다. HC-L EA 분획물의 DPPH, ABTS 및 nitrite 소거능에 대한 RC50은 각각 30.9, 19.9, 49.6 μg/ml로 계산되었다. 따라서 COS-F와 HC-L의 조합은 항산화 기능성 음료 개발에 우수하리라 판단된다. 한편 항혈전 활성 평가의 일환으로 TT (Thrombin Time), PT (Prothrombin Time) 및 aPTT (activated Partial Thromboplastin Time)을 측정한 결과, 5종 약용식물의 에탄올 추출물 중, LCM-F 추출물을 제외한 4종 추출물은 양호한 항혈전 활성을 보였으며, 특히 COS-F 및 LCE-L 추출물에서 혈액응고인자 저해에 따른 우수한 aPTT 연장효과를 확인하였다. 25종의 시료 중 COS-F 및 LCE-L의 EA 분획물이 강력한 항혈전 활성을 나타내었으며, COS-F의 EA 분획물은 2.5mg/ml 농도에서도 용매 대조구(DMSO)에 비해 15배 이상 연장된 TT, PT활성을 보여, 실제적인 항혈전제로 개발 가능함을 확인하였다. 본 연구 결과는 기존 항산화 활성 및 항혈전 활성이 보고된 약용작물의 분획물 조합을 통해 다기능 음료 개발에 이용될 것이다.

P5-28

Antioxidant capacity and transcriptome responses of lactic acid bacteria isolated from kimchi

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Five different species of lactic acid bacteria (LAB) isolated from kimchi were investigated for their antioxidant potentials. *Latilactobacillus* sp., *Companilactobacillus* sp., and *Lactococcus lactis* sp. showed higher ability in radical scavenging activity, reducing power, and inhibition of lipid peroxidation compared than other strains. In addition, they could tolerate hydrogen peroxide up to 2.5 mM. To explore the antioxidant mechanism of kimchi LAB strains, the transcriptomomic differences were further compared by RNA sequencing between the hydrogen peroxide-exposed and untreated groups. The result revealed that cell membrane responses from each LAB strains predominated in the main categories of gene ontology classification, suggesting that cellular components and potential cellular interactions are important for oxidative stress exposure. Therefore, these strains could be considered for potential antioxidant starter culture uses in the production of functional fermented foods.

P5-29

A study on the phytoestrogenic effect of black raspberry (*Rubus occidentalis*) extract

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Menopause is diagnosed after 12 months of amenorrhoea resulting from the permanent cessation of ovarian function. The extensive climacteric symptomatology falls into somatic (vegetative) symptoms (vasomotor disorders, psychic disorders), organic symptoms (skin changes, urogenital changes, weight changes), and metabolic symptoms (lipid spectrum changes, atherosclerosis, osteoporosis). The purpose of this study was to examine the phytoestrogenic effect of the unripe black raspberry (*Rubus occidentalis*) extracts in human breast cancer cell lines. The estrogen responsive human breast cancer MCF-7 cells were examined for its response to unripe black raspberry (*Rubus occidentalis*) extracts. After MCF-7 cells were treated with the extract of unripe black raspberry (*Rubus occidentalis*), estrogen receptor α (ESR-α), estrogen

receptor β (ESR-β), and sP2 (estrogen-responsive gene) mRNA levels were measured. CYP19 (aromatase) was also measured. As a result, the mRNA expression of ESR-α was not affected. However, ESR-β mRNA levels were increased by the treatment of unripe black raspberry black raspberry (*Rubus occidentalis*) extract. Furthermore, expression of the estrogen-responsive gene pS2 was induced in MCF-7 cells in response to treatment with unripe black raspberry black raspberry (*Rubus occidentalis*) extracts. In addition, CYP19 mRNA levels were also increased by the treatment of unripe black raspberry (*Rubus occidentalis*) extract. As a result, these results provide the first evidence that the beneficial effects of unripe black raspberry (*Rubus occidentalis*) may be mediated, at least in part, by the phytoestrogenic effects.

P5-30

A study on nutritional value of traditional salt-fermented fish sauces as a natural seasoning

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This study was conducted to investigate the nutritional value of traditional salt-fermented fish sauce as a seasoning. We analyzed and compared local(Buan Gom-so) anchovy sauce(LAS) and Korean traditional soy sauce(KSS). The total nitrogen content and salinity of LAS were 1.24～1.82% and 18.5～21.2%, respectively and all LAS met standards. Potassium(K) was the highest mineral content of LAS followed by Mg, Ca. The amount of K was higher in KSS than LAS. The total free amino acids of LAS were 58,494～106,403 mg/kg, while that of the KSS was 18,605～31,474 mg/kg. Aspartic acid and Glycine, known as umami taste, were 3,235～31,355 mg/kg and 2,005～4,082 mg/kg in LAS, respectively, which were higher than KSS. All LAS contained eight essential amino acids and that total amount was 24,012～33,543 mg/kg. As a result of this study, Buan Gom-so anchovy sauce that contained a lot of nutrients and tastes ingredient was excellent as the sauce.

P5-31

4종 홍잠의 항산화 및 항혈전 활성

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누에는 누에나방과의 누에나방 유충을 말하며, 우수한 영양성분 이외에도 항당뇨활성물질을 다량 함유하여 건강기능식품 소재로 이용되고 있다. 누에의 경우 5령 3일이 지나면 배속의 실크단백질이 단단하게 변화하여 식용이 어려운데, 5령 7일 숙잠을쪄서 익힌 다음 동결건조하여 식용가능하게 가공한 것을 홍잠이라고한다. 홍잠은 알츠하이머 치매 예방 효과와 알코올성 지방간, 간암및 간경화 예방 등의 효과가 보고된 바 있다. 본 연구에서는 홍잠의 식의약품소재 개발을 위해, 국내 농가에서 주로 사육하고 있는 4종 홍잠 (백옥잠, 골든실크, 주황잠 및 연녹잠)의 열수 추출물과 에탄올 추출물을 조제하여 항산화 및 항혈전 활성을 평가하였다. 그 결과, 추출효율은 열수 추출물이 에탄올 추출물보다 전체적으로 2배정도 높게 나타났다. 총 폴리페놀 함량은 주황잠과 백옥잠의 열수 추출물에서 높게 나타났으며 총당 함량은 연녹잠의 열수 추출물에서 가장 높게 나타났다. 항산화 활성 평가결과, 주황잠의 열수 추출물에서 DPPH, ABTS, Nitrite 소거능이 각각 64.5%, 88.5%, 44.7%로 높게 나타났으며 환원력은 0.893으로 가장 높게 나타났다. 항혈전 활성의 트롬빈 저해는 주황잠의 열수 추출물에서, 프로트롬빈 저해는 백옥잠 에탄올 추출물에서, 혈액응고인자 저해는 주황잠과 백옥잠의 열수 추출물에서 높은 활성을 나타내었다. 본 연구 결과는 홍잠 추출물을 이용한 항혈전, 항산화 소재 개발이 가능함을 제시하고 있다.

P5-32

Quality characteristics and antioxidants properties of persimmon (*Diospyros kaki* Thunb.) leaf tea

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Tea contains a large amount of various pharmacological and functional ingredients. Persimmon (*Diospyros kaki* Thunb.) leaf is known to have a beneficial effects against hypertension, stroke, atherosclerosis, and dermatitis. The aim of this study is to find the optimal extraction conditions to increase the quality and biological function in order to increase utilization of persimmon leaf tea. Different concentrations of persimmon leaf tea (PLT) were produced by hot water extraction (0.1, 0.5, 1, 2, 5 and 10 mg/mL) and the color quality characteristics and antioxidant activity were analyzed. The analysis of color values revealed that the L* (lightness) value of 0.1 mg/mL PLT was the highest (48.31), while the a* (redness) values of 10 mg/mL PLT was

8.37. The b* (yellowness) value of 0.5 mg/mL was the highest (31.50). Antioxidant effects of the PLT was evaluated by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) radical scavenging activity assay. DPPH and ABTS scavenging activities of the PLT at were 0.053 mg AAE/mL (PLT 0.5 mg/mL) and 908.10 mg TE/mL, respectively. Total polyphenol contents of 10 mg/mL PLT was 0.179 mg GAW/mL (PLT 10 mg/mL). As a result of measuring the physiologically active ingredients of PLT with the HPLC-DAD system, the main components of PLT were p-coumaric acid, ellagic acid, caffeic acid, kaemferol-3-O-glucoside, quercetin-4-glucoside, quercetion and kaemferol. These results suggest that 10 mg/mL of PLT was the optimal extraction condition. Also, it imply that the quality of the highest concentration of PLT is the best for phytochemical material.

P5-33

Screening of plants extracts from gyeongbuk area for antibacterial and anti-inflammatory activity

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The antibacterial and anti-inflammatory effects of 23 different edible plant extracts from Gyeongbuk area were evaluated in this study to select new functional materials. Each extract was extracted with 100% methanol and tested by the disk diffusion method, a method for measuring the antibiotic sensitivity of bacteria. For antibacterial effects of the extracts, *Staphylococcus aureus,* a gram-positive bacterium, and *Escherichia coli,* a gram-negative bacterium, were used, and chloramphenicol, an antibiotic, was used as a positive control. As the results, *Cardamine amaraeformis Nakai, Broussonetia papyrifera (L) L'Her. ex Vent, Chrysosplenium flagelliferum F.Schmidt, Capsella bursa-pastoris (L) L.W. Medicus* extract showed inhibitory effects against *S. aureus* with the clear zones of 5.5~6 mm. On the other hand, only *Albizia julibrissin Durazz* extract showed an inhibitory effect against *E. coli.* For anti-inflammatory effects, the production of nitric oxide (NO) was assessed in lipopolysaccharides-stimulated RAW 264.7 cells. Except for *Mukdenia rossii (Oliv) Koidz,* the 22 extracts showed no cytotoxicity, and the 12 extracts suppressed the NO production. In conclusions, the four extracts. such as *B. papyrifera (L) L'Her.ex Vent, B.*

kazinoki Siebold (leaf), Aralia cordata var. continentalis(Kitag.) Y.C.Chu, and *Morus bombycis Koidz* have both antibacterial and anti-inflammatory effects. These results provide basic research data for the development of multifunctional food materials.

P5-34

Evaluation of quality properties of plant-based protein material

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The processing aptitude of legume powder (red bean, chickpea) and rice bran containing a large amount of plant-based protein was investigated for the manufacture of vegan food, and their quality characteristics were compared with commercially available protein isolates (soybean, pea). The protein contents of isolated soy and pea protein were 76.3~72.7g/100g, while those of red bean, chickpea and rice bran were 15.4~21.9g/100g. Water absorption capacity (WAC) was the highest in soy protein isolate (791%), followed by pea protein isolate (443%), rice bran (278%), chickpea (111.30%), and red bean (111%). Soy protein isolate showed the highest water solubility (47%), followed by chickpea (31%), red bean (30%), pea (18%), rice bran (18%). Oil absorption capacity (OAC) was in the order of soy protein isolate (260%), rice bran (212%), pea protein isolate (203%), chickpea (192%), and red bean (184%). DPPH and ABTS radical scavenging activities indicating antioxidative capacity were significantly higher in red bean and rice bran than in the other plant proteins ($p<0.05$). The pH of soybean protein isolate and pea protein are 7.2-8.0, others were 6.5-7.1, and the apparent density was the highest in red bean (0.69±0.02 g/mL). In present study, red bean, chick pea and rice bran showed lower water absorption and water solubility than isolated proteins, but had similar oil absorption capacity, higher antioxidant capacity, and higher apparent density than the isolated proteins, so these legume powders can be industrially used as important high-protein ingredients for vegan food production.

P5-35

Regulation of blood glucose homeostasis by procyanidin A2 : *in silico, in vitro* and *in vivo* analysis

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In this study, *in silico, in vitro,* and *in vivo* assay were conducted to investigate the ability of Procyanidin A2 (PA2) to regulate blood glucose homeostasis. *In silico* assay predicted binding energy using three molecular docking programs, and *in vitro* assay were performed through α-glucosidase inhibitory assay, enzyme kinetics assay, MTT assay and western blot assay. The type 2 diabetes model induced by streptozotocin (STZ) and Nicotinamide (NA) was *in vivo* assay through oral glucose tolerance test (OGTT), insulin tolerance test (ITT), and histochemical tests. Experimental results show that PA2 inhibits α-glucosidase activity with an IC50 value of 3.62 ± 0.84 μM and acts as a competitive inhibitor. In addition, in the western blot assay, PA2 activated insulin signaling, increasing glucose transporter 4 (GLUT4) potential and phosphorylation of AKT and AMPK. To investigate the effect on insulin resistance, OGTT and ITT were performed after oral administration of PA2 for 5 weeks in a mouse model of type 2 diabetes induced by STZ and NA. It showed the effect of suppressing the rise of blood glucose and improving insulin level. Taken together, these results suggest that PA2 exhibits potential usefulness as a novel antidiabetic material by improving glucose homeostasis by increasing glucose uptake, improving insulin resistance in type 2 diabetes, and suppressing blood glucose rise.

P5-36

Optimization of the extract conditions of *Acacia* species by response surface methodology and assessment of anti-oxidant potential

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We conducted the optimized extraction condition of leaf and bark of *Acacia nilotica* (AN) and *Acacia farnesiana* (AF) by conducting response surface methodology (RSM). The effect of ethanol concentration (X1; 25-75%), extraction time (X2; 10-30 min), and extraction temperature (X3; 40-60 ℃) on the antioxidant potential was confirmed. We conducted 2,2-diphenyl-1-1picrylhydrazyl (DPPH) scavenging activity, cupric reducing antioxidant capacity (CUPRAC) and ferric reducing antioxidant power (FRAP), total phenolic content (TPC), and total flavonoid contents (TFC) to compare experimental values and RSM-predicted values. ANB, AFL, AFB had α-glucosidase inhibition activity. AFB had elastase and tyrosinase inhibition activity. Altogether, our findings can provide a practical approach for utilizing AN and AF in various bioindustries.

P5-37

5종 약선 추출물의 항산화 및 항당뇨 활성 비교

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본 연구는 약선 소재 5종(건강, 갈근, 지골피, 맥문동, 천궁) 추출물의 항산화 및 항 당뇨 활성을 평가하였다. 약선 소재 5종을 열수 추출하여 여과한 후 동결 건조하여 분석시료로 사용하였다. DPPH 및 ABTS 소거능을 분석하여 항산화 활성을 평가하였고, α-amylase 및 α-Glucosidase 저해 활성을 분석하여 항당뇨 활성을 평가하였다. DPPH 라디칼 소거능은 지골피가 79.81%로 가장 높은 소거능으로 나타났으며, ABTS 라디칼 소거능은 건강, 갈근이 90.22%, 90.48%의 소거능으로 나타났다. α-amylase 억제 활성에서 지골피 추출물이 66.92%로 가장 높은 억제 활성을 나타냈고, α-Glucosidase 저해활성 또한 지골피가 가장 뛰어난 억제 효과를 나타내었다. 본 연구에서 지골피 추출물이 우수한 기능성 소재로 사용될 수 있을 것으로 사료된다.

P5-38

Antioxidant activity of *Dioscoreae rhizoma(Sanyak)* fermented with *Aspergillus awamori* and quality characteristics germinated black rice porridge

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In this study, black rice porridge was manufactured using fermented *Dioscoreae rhizoma*(DR) and germinated black rice, and attempted to compare their quality characteristics to use it as materials for the development of elderly-friendly food. In the previous study, 'Jindo No.2', a black rice variety with the highest GABA content, was used 3 days after germinatation. The extract was added according to the concentration (0%, 1%, 3%, 5%) to make porridge, and its quality characteristics (pH, acidity, reducing sugar) were investigated. The free radical scavenging activity of DPPH increased from 33.67 before fermentation to 49.99% after fermentation, an increase of about 30%, and ABTS increased from 42.33% before fermentation to 58.68% after fermentation. The total phenolic content increased significantly after fermentation. As a result of quality characteristics by adding the extract to the germinated black rice porridge, it was found that with the increase of the amount of the extract, the pH value decreased, the acidity increased, and the viscosity decreased. The reducing sugars increased significantly when 3% or more of the extract was added. When about 1% of fermented acid was added, the sweetness, texture, and preference were found to be the best. As a result, fermented DR shows antioxidant activity and is expected to be used as an aging-friendly food or functional material by utilizing the material.

P5-39

Metabolites profiling of ripe ajwa date pulp (*Phoenix dactylifera* L.) using response surface methodology and artificial neuronal network models

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The aim of this study was to optimize the heat reflux extraction (HRE) of ripe Ajwa date pulp using response surface methodology (RSM) and artificial neural network (ANN) modeling to increase its polyphenolic content and antioxidant activity. A central composite design was used to optimize HRE to achieve the maximum polyphenolic compounds and antioxidant activity of target responses as a function of ethanol concentration, extraction time, and extraction temperature. From RSM estimates, 75.00% ethanol and 3.5 h (extraction time), and 68°C (extraction temperature) were the optimum conditions for generating total phenolic content (4.41 ± 1.02 mgGAE/g), total flavonoid content (3.11 ± 0.65 mgCAE/g), 2,2-diphenyl-1-picrylhydrazyl (11.10 ± 0.78 % of inhibition) and cupric reducing antioxidant capacity (1.49 μM ascorbic acid equivalent). The good performance of the ANN was validated by statistical metrics. Seventy-three secondary metabolites, including 13 new bioactive chemicals, were detected using high-resolution mass spectroscopy.

P5-40

Optimization of extraction conditions of *Portulaca oleracea* L. extract using RSM, ANN and characterization of bioactive compounds by high-resolution mass spectroscopy

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Portulaca oleracea L. is a well-known medicinal plant that is used both as a traditional medicine and as an edible herb to treat a variety of ailments. The goal of this study was to find the best way to extract polyphenols and antioxidants from the aerial part of *Portulaca Oleracea* (APO) using heat reflux extraction (HRE) and response surface methodology (RSM) and artificial neural network (ANN) modeling. A central-composite design (CCD) was used to find the best combination of ethanol concentration, extraction time, and extraction temperature to get the most polyphenolic compounds and antioxidant activity from HRE. RSM found that 67.0% ethanol, 88 minutes, and 52°C were the best conditions for getting the highest amount of TPC (46.58 ± 0.56 mgGAE/g), TFC (8.12 ± 1.05 mgCAE/g), DPPH scavenging activity (38.65 ± 0.92 % of inhibition) and FRAP (33.25 ± 1.09 µM ascorbic acid equivalent). Statistical metrics such as the coefficient of determination (R2), root-mean-square error (RMSE), absolute average deviation (AAD), and standard error of prediction (SEP) revealed the ANN's superiority. High-resolution mass spectrometry was used to find 91 secondary metabolites, including 21 new bioactive chemicals. Overall, these results suggest that the optimized extraction condition, using RSM-ANN can be used in a board commercial applications as a promising ingredient for the development of functional foods and nutraceuticals and in the cosmetic industry - shedding light on the bright side of human health.

P5-41

γ-mangostin attenuates UVB-Induced photoaging in HaCaT cells through the inhibition of MAPK / AP-1 / MMP-1 Signaling

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γ-Mangostin (γM) is one of the major xanthones found in nature, and xanthones are already known to exhibit anti-tumor effect by blocking singnaling pathway that multiply cancer cells even at low concentration, and also show antioxidant and anti-inflammatory effects. This study applied the characteristics of xanthones to anti-photoaging effects. Therefore, the aim of this study is to measure the photoaging inhibitory activity of γM in HaCaT cells exposed to UVB and to confirm its underlying mechanism. γM showed elastase inhibitory activity. As a result of confirming kinetics for elastase, it was proved that γM acts as a competitive inhibitor. γM began to exhibit cytotoxicity at 5 μM in UVB exposed HaCaT cells, but significantly inhibited reactive oxygen species (ROS) production. γM treatment inhibited UVB-induced collagen degradation and the expression of MMP-1, and stimulated not only the expression of SIRT-1, also Elastin, TIMP1, and Has2, which are indicating skin condition. Furthermore, γM treatment markedly inhibited the expression of AP-1 and NF-κB downstream by deactivating the expression of ERK JNK p38 proteins activated by UVB. Overall, these results demonstrate that γM can protect skin exposed to UVB by attenuating MMP-1 activity and collagen degradation through the downregulation of MAPK / AP-1 / NF-κB signaling, thereby confirming its anti-photoaging potential.

P5-42

In silico approach to functional ingredients: autophagy-enhancing melanogenesis inhibition through the combination of flavonoids

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In this study, screening was conducted through "in silico" analysis, an experiment conducted using a computer or computer simulation in the fields of biology and experimental science. The goal was to screen natural-derived functional ingredients that can inhibit melanin synthesis by autophagy enhancing and to prove their function. Screening based on the database constructed in our laboratory, it was found that one of the flavonoids "Procyanidin A2 (A2)" and "Quercetin (QC)" had high binding energy with mTOR, a biomarker of autophagy activation.

After that, the two screened flavonoids were tested individually or in the form of a mixture. As a result of Western blot in MNT-1 cells (melanoma cells), the expression of representative autophagy biomarkers LC3-II, ATG5 and Beclin 1 was higher when the mixture was treated than when A2 and QC were treated separately. And as a result of evaluating the melanin synthesis inhibitory ability, when each of the two flavonoids was treated in the cells, it was shown that the melanin synthesis inhibitory ability of about 10-20% compared to NT (non-treated group). However, the treatment of the mixture of the two flavonoids showed better results by inhibiting the melanin synthesis ability by more than 40%.

Through this, the mixture of QC and A2 suggests the potential as a new functional material with the ability to inhibit melanin synthesis through autophagy enhancing.

P5-43

Physicochemical characteristics of *Spirulina platensis*

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Cyanobacterial algae is considered as one of the important food resources of mankind. This includes the Spirulina which are natural health food products that contain various nutrients and has a high utilization efficiency. Therefore, the quality characteristics of Spirulina were analyzed in this study. Based on the results, the total phycocyanin content of Spirulina was 827.60±0.58 μg/mL. In terms of antioxidant properties, the DPPH and ABTS radical scavenging activities were measured as 0.52±0.00 mg GAE/g and 3.65±0.02 mg AAE/g, respectively. For the chromaticity, L value (lightness) was recorded at 40.58±0.03; a value (redness) at 1.09±0.03 and; b value (yellowness) at 0.32±0.02. Specifically, the β-carotene content of Spirulina (29450.68±1709.82 μg/100 g) was about five times higher compared to the β-carotene content of carrots (5,516.00 μg/100 g) based on the reported data of the Ministry of Food and Drug Safety. Moreover, the vitamin E content of Spirulina was recorded at 13.2 α-TE mg/100 g while the vitamin B6, B9 and B12 were recorded at 0.02±0.00 μg/100 g, 20.67±0.37 μg/100 g and 102.70±0.03 μg/100 g respectively. Overall, it can be deduced that Spirulina can be used as an excellent natural material based on its functional and nutritional content.

P5-44

Anti-inflammatory and wound healing effects of analgesic potential using in vivo oral ulcer model of CBG (Cannabigerol)

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Oral ulcer is an inflammatory ulcer that occurs in mucous membranes inside the mouth and when it occurs, it is accompanied by severe pain and can cause eating disorders, but there is no clear treatment yet. Cannabigerol(CBG) is one

of the main substances of *Cannabis sativa* L., and it is not a psychoactive compound, and research has been conducted focusing on the protective effect of nerve cells. In this study, we studied the pain relief potential in oral ulcer pain model, aimed to the wound healing and anti-inflammatory effect of CBG in HaCaT cells and RAW264.7 cells. Treatment with CBG(5, 10, 20, 25 μM) suppresses the expression of NO in a concentration-dependent manner without affecting cell viability by downregulating iNOS and COX-2 expression in LPS-induced RAW 264.7 cells. Furthermore, CBG attenuates the production of pro-inflammatory chemokines including TNF-α, IL-1β assessed by immunocytochemistry. In the wound healing assay, CBG reduced the wound area to 5, 10, 20, 25 μM which did not affect cell viability, and in particular, at the highest concentration of 25 μM, it showed 81.2 % cell migration rate (at day 2) in HaCaT cells. Based on these studies, the current data support that the in vivo pain relief potential of CBG can be expected in the mouse model, and the experiment will be conducted through the oral ulcer mouse model, which can confirm additional ulcer healing and analgesic effects.

P5-45

기린초 에탄올 추출물의 기능성에 관한 연구

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기린초는 돌나물과에 속하는 여러해살이 초본으로 전국 각지의 바위틈에서 자생하고 있지만 기린초는 정원수로만 이용되고 있으며 식품소재로서 개발 및 연구가 매우 낮아 본 연구에서는 기린초를 지상부와 지하부로 나누어 70% 에탄올로 추출하고, 각 추출물의 기능성을 확인하여 기능성 식품 개발 소재의 기초 자료로 활용될 수 있도록 연구를 진행하였다. 기린초의 지상부와 지하부 에탄올 추출물의 총 플라보노이드 함량은 지상부 17.06 mg/100g, 지하부 18.02 mg/100g이었다. 전자공여능을 측정한 결과 기린초 에탄올 추출물은 62.5 μg/mL 농도에서 지상부 84.80%, 지하부 82.18%이었고, 125 μg/mL 농도에서 지상부 86.99%, 지하부 85.16%, 250 μg/mL 농도에서 지상부 90.39%, 지하부 88.46%, 500 μg/mL 농도에서 91.38%, 지하부 90.08%, 1,000 μg/mL 농도에서 지상부 92.43%, 지하부 94.16%로 추출물의 농도가 증가함에 따라 전자공여능은 증가함을 보였고, 모든 농도에서 대조구인 ascorbic acid보다 전자공여능이 높았다. SOD 유사활성을 측정한 결과에서는 기린초 에탄올 추출물 62.5 μg/mL 농도에서 지상부 5.85%, 지하부 9.80%, 125 μg/mL 농도에서 지상부 18.23%, 지하부 22.45%, 250 μg/mL 농도에서 지상부 33.74%,

지하부 44.08%, 500 μg/mL 농도에서 지상부 61.36%, 지하부 66.94%, 1,000 μg/mL 농도에서 지상부 94.15%, 지하부 97.96%으로 추출물의 농도가 증가함에 따라 SOD 유사활성이 높아졌으며, 62.5~500 μg/mL 농도에서는 대조구인 ascorbic acid보다 기린초 에탄올 추출물의 SOD 유사활성이 높았다. 환원력을 측정한 결과에서는 기린초 에탄올 추출물 62.5 μg/mL 농도에서 지상부 0.18, 지하부 0.32이었고, 125 μg/mL 농도에서 지상부 0.27, 지하부 0.57, 250 μg/mL 농도에서 지상부 0.49, 지하부 1.00, 500 μg/mL 농도에서 지상부 0.91, 지하부 1.70, 1,000 μg/mL 농도에서 지상부 1.55, 지하부 2.45으로 농도 의존적으로 높아졌으며 특히, 지하부 에탄올 추출물 250 μg/mL 농도부터는 대조구보다 환원력이 높았다. 따라서 기린초 에탄올 추출물은 낮은 농도에서도 높은 활성을 보여 기능성 식품의 소재 개발로서 가치 창출에 많은 기여를 할 것으로 생각된다.

P5-46

Nutritional and functional characteristics of three varieies of korean cabbage (*Brassica rapa.* L): korean cabbage (KC), red korean c(RKC) and golden korean cabbage *(GKC)*

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Nowadays various types of cabbages are cultivated through continuous variety improvement. As a result, utilization of these new varieties as main ingredient of kimchi are frequently observed. However, information regarding their nutrient content is still insufficient. In this study, the size, moisture content, pH, color and antioxidant properties of three kinds of cabbages (Korean cabbage (KC), red Korean cabbage (RKC), and golden Korean cabbage (GKC)) were determined and vitamins A and E were analyzed. As seen in their morphological characteristics, GKC has the largest leaves while RKC has the smallest diameter. Based on the results, no significant difference were observed in terms of moisture content and pH among the treatments. As regards with color, highest L value (lightness) was seen in KC while highest a value (redness) was seen in RKC. On the other hand, GKC attained the highest b value (yellowness). In terms of DPPH, ABTS, and TPC, RKC had the highest value while GKC had the highest TFC value. On the other hand, retinol, β-carotene, tocopherols and tocotrienols were analyzed through saponification-HPLC analysis. As to retinol activity equivalents (RAE), highest value was seen in GKC (75.6 μg/100 g) while highest α-tocopherol equivalent (α-TE) was seen in KC (4.9 mg/100 g).

P5-47

Effect of enzymatic hydrolysis by crown flower plants on characteristics and antioxidant activity of milkfish protein

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Fish protein hydrolysates are potential as a natural antioxidant. In this study, milkfish was evaluated as raw material for obtaining fish protein hydrolysates showing antioxidant activity. This study aimed to know the antioxidative properties of milkfish protein hydrolyzed by crown flower plant enzymes and to evaluate the effective combination of enzyme concentration and the length of hydrolysis. Milkfish protein hydrolysates were prepared by various enzyme concentrations consisting of 4%, 5%, 6%, and different hydrolysis lengths of 2, 4, and 6 hours. The analysis conducted on milkfish protein hydrolysates includes protein content, degree of hydrolysis, amino acid composition, molecular weight, mineral content, antioxidant activity by 2,2-diphenyl-1-picrylhydrazyl (DPPH) and reducing power methods. The results of this study indicate that the highest protein content, and degree of hydrolysis, respectively, were 65.69% and 86.33%, which were obtained by using 4% (39 unit) crown flower plants enzyme with a hydrolysis length of 2 hours. The hydrolysates had 15 amino acids, and the highest three of them were glutamic acid (12.05%), aspartic acid (7.30%), and lysine (6.89%). The molecular weight test results stated that the sample with the highest protein content scored 10.40 kDa and 43.71 kDa. Potassium (K) was the highest mineral content (13.327 ppm) obtained from hydrolysis. Moreover, the antioxidant activity test results showed that 33.25% was the highest % of radical scavenging activity (RSA) value with the half maximal inhibitory concentration (IC50) about 1741.66 ppm and the reducing power absorbance value of 0.365 was obtained in combination treatment of 4% enzyme and hydrolyzed for 2 hours.

P5-48

Effect of fermented *Platycodon grandiflorus* extract by lactic acid bacteria on liver protection

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Alcoholic liver diseases caused by excessive drinking include fatty liver, alcoholic hepatitis, and alcoholic cirrhosis, and mental stress and smoking increase liver damage, causing the body to fail to defend and detoxify the immune system and cause other diseases. The main compound of *Platycodon grandiflorus* include saponins, flavonoids, phenolic acids, and other compounds. It contains a large number of fatty acids such as linoleic acid (up to 63.24%), a variety of amino acids, vitamins, and multiple essential trace elements has been widely used as a oriental medicine and food source because it has greate potentials for cure. In this study, fermented *P. grandiflorus* extract by *Lactobacillus plantarum,* and this fermentation solution was treated on liver cells damaged by acetaminophen to investigate whether liver protection function was improved. The survival rates of hepatocytes that caused hepatotoxicity with 10 mM acetaminophen and simultaneously treated with 10 μg/mL of *P. grandiflorus* extract and *P. grandiflorus* extract fermented with *L. plantarum* were measured to be 118.8% and 126.5%. Hepatotoxicity was caused by 10 mM acetaminophen, and the secreted lactate dehydrogenase (LDH) and alanine aminotransferase (ALT) were measured and decreased compared to the untreated group. In the case of LDH, the *P. grandiflorus* extract fermented with *L. brevis* was measured to be 10.8 ng/mL. In the case of ALT, the secretion of ALT decreased by 4.5 ng/mL when fermented with *L. plantarum* rather than *P. grandiflorus* extract.

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P5-49

Ultrasonic pretreatment and enzymatic hydrolysis conditions for preparation of cricket protein hydrolysate

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Cricket (*Gryllus bimaculatus*) is one of the edible insects recognized as a human food source in Korea, as it contains a lot of unsaturated fatty acids as well as protein, it is in the spotlight as future food. Although edible insects have high nutritional value, it has limitations of usability as food because of particular smell and negative prejudice against insects. Therefore, more studies are necessary to utilize cricket as food materials. Protein hydrolysate has higher solubility and digestibility than natural protein. So it is highly useful as a dietary supplement for patients with metabolic diseases, athletes, and the elderly. This study was conducted to prepare cricket protein hydrolysates using ultrasonic pretreatment and enzymatic hydrolysis to improve palatability and food availability of cricket. The soluble protein content and the degree of hydrolysis of the protein hydrolysate were measured according to enzyme type, ultrasonic pretreatment time, and enzyme concentration. Alcalase hydrolysates possessed the highest soluble protein content and the degree of hydrolysis. Ultrasonic pretreated hydrolysates possessed a higher soluble protein content and degree of hydrolysis than non-ultrasonicated hydrolysis. In addition, the soluble protein content of the hydrolysates according to the ultrasonic pretreatment time showed the significantly the highest values in the hydrolysate obtained by pretreatment for 10 min. As the enzyme concentration increased, the soluble protein content and degree of hydrolysis increased, but there was no significant difference between 2.0% (w/w) and 1.5% (w/w) enzyme concentration. From the above results, the conditions for preparing a protein hydrolysate of cricket were determined by ultrasonic pretreatment for 10 min and hydrolysis using 1.5% (w/w) Alcalase.

P5-50

Nutritional compositions of shellfish in the Islands of jeollanam-do

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In this study, *Pollicipes mitella, Omphalius rusticus, Liolophura japonica,*

Cellana toreuma were collected at Yeosu Sonjukdo Wando Saengildo, Jindo Gwanmaedo, and their proximate composition, amino acid content, and mineral content were analyzed. The proximate compositions of four kinds of shellfish were 69.63 ~ 81.40 % moisture, 12.28 ~ 21.41 % crude protein, 0.92 ~ 5.19 % crude lipid and 2.23 ~ 7.17 % crude ash. The proportion of essential amino acids in all four samples is similar at 31.00 ~ 38.02 %, and the amino acids were highest in the order of Glycine(1,733.81 ~ 3,183.33 mg/100 g), Glutamic acid(1,318.72 ~ 2,967.15 mg/100 g) and Arginine(741.18 ~ 1,731.24 mg/100 g). The content of minerals in all four samples was higher in the order of Na(306.93 ~ 661.25 mg/100 g), K(219.58 ~ 360.72 mg/100 g), Ca(90.78 ~ 368.98 mg/100g), Mg(55.95 ~ 298.40 mg/100 g), Fe(7.84 ~ 86.66 mg/100 g), Zn(2.71 ~ 28.09 mg/100 g). The total polyphenol content was highest in *Pollicipes mitella*(13.86 ~ 21.45 mg GAE/g). When the ABTS radical scavenging activities were 1,000 μg/mL, the ABTS cation scavenging activity was highest in *Pollicipes mitella,* followed by *Omphalius rusticus.* These experimental results could provide basic information for utilizing as excellent marine resources in Jeollanam-do.

Key words : *Pollicipes mitella, Omphalius rusticus, Liolophura japonica, Cellana toreuma*, nutritional compositions