STUDENT POSTER ABSTRACTS

FOOD IN A CHANGING WORLD

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Abstracts

S01
Presenting Author Abdul Halim Farawahida (Farah)
Authors Abdul Halim Farawahida, Jon Palmer, Steve Flint
Poster Title Changes of citrinin, pigments, and pH during incubation of *Monascus* spp. on Coconut Cream Agar

ABSTRACT
Monascus spp. are usually used as a fungal starter to produce red fermented rice (RFR). Pigments produced by *Monascus* spp. are important to act as colour and flavouring agents and have health benefits. Unfortunately, citrinin (CIT) is also produced during *Monascus* spp. fermentation and this is a food safety concern. The objective of this study was to determine the citrinin, pigments and pH levels during incubation of *Monascus* spp. isolates on Coconut Cream Agar (CCA). Two *Monascus* spp. isolates from RFR (MF1 and MS1), inoculated onto CCA, were incubated at 30˚C for 30 days. The citrinin, pigments and pH levels were recorded along the incubation period using HPLC, a microplate reader and pH meter, respectively. CIT levels increased from day 4 until day 6-8 and then decreased during the incubation. The pigments produced by Monascus spp. increased after 8 days of incubation suggesting a relationship between pigment production and citrinin reduction. The pH of both isolates on CCA increased from 7 to 8.4. These results provide a basic understanding on the relationship between the CIT, pigments, and pH levels during incubation of *Monascus* spp. on CCA.

S02
Presenting Author Shuva Bhowmik
Authors Shuva Bhowmik, Dominic Agyei, Azam Ali
Poster Title Smart hydrogel film potential for active food packaging

ABSTRACT
Hydrogels are three-dimensional (3D) hydrophilic polymer network structures capable of retaining and absorbing substantial moisture (even up to 100% w/w). Chitosan is a common 'green' biopolymer found in nature through the deacetylation of chitin. Chitosan is gaining popularity as a food packaging material due to its structural properties, hydrophilicity, potent antioxidant qualities, film-forming capacity, hydrogel-forming ability, environmental friendliness,

and antibacterial properties activity. In this study, chitosan, its derivatives, and other biomaterials are used to generate an effective bioactive hydrogel that is structurally a packaging film. The physical, mechanical, optical, structural, barrier, morphological, biodegradability, and bioactive properties of hydrogel film were investigated. The physical and mechanical properties were affected by the addition of other biomaterials to chitosan. For example, the moisture level was reduced (by 13.99%) and tensile strength increased (from 25.98 to 75.87 MPa). The developed films exhibited excellent antioxidant activity with DPPH scavenging capacity, and scanning electron micrographs demonstrated that the fabricated films had homogenous surfaces. Our findings suggest that the developed bioactive hydrogel film could be considered an active packaging material in the food industry.

S03

Presenting Author Priyanthi Chandravarnan
Priyanthi Chandravarnan, Dominic Agyei

Poster Title Fundamental understanding of physical and microstructure characteristics of microwave-treated rice

ABSTRACT
Rice is one of the most stable foods globally. The demand for rice production has recently increased due to the increasing population and the need for gluten-free foods. The microwave (MW) technique has importance in the rice industry for dying, parboiling, microbial and toxin inactivation and functional modification due to its uniform heating, safe handling, ease of operation, and low maintenance requirements. However, research on the effect of MW treatment on the physical properties of uncooked rice is limited. This study explores how MW treatment affects the physical and structural properties of rice. The physical and microstructure studies showed that as the MW power (560W-720W) and time (120 - 360s) increased, rice colour changed, and stress cracks were developed with MW treatment and passed through the pericarp of the rice. The starch granules swelled after MW treatment compared with those in untreated(control) rice. MW treatment altered the short-range order of the starch by the destruction of the crystalline region of the amorphous region. However, MW power and treatment time have no significant ($p=0.05$) effect on the degree of double helices. The MW treatment increased the onset temperature, peak temperature, and concluding temperature of the rice and reduced the gelatinization enthalpy of the treated sample compared to the control. Furthermore, the water absorption capacity, oil absorption capacity, water absorption index, and swelling power of the rice flour increased with MW treatment. We anticipate that MW treatment alters the microstructure and physical characteristics of rice, and these structural changes are expected to impact the cooking quality and textural characteristics of rice.

S04
Presenting Author Emily Fanning
Authors Emily Fanning, Biniam Kebede, Graham Eyres, Russell Frew
Poster Title Can a rapid method predict the origin of NZ Hops?

ABSTRACT
Hops are an essential ingredient in beer, and the increase in craft beer's popularity has boosted the need to produce unique breeds of hops with distinctive hop aromas. New Zealand has some of the world's most sought-after hops due to the unique cultivar genetics combined with the effect of geographical origin, which also influences the quality attributes. However, New Zealand's production only contributes approximately 1.5% to the total hop market, so there is potential to increase hop production by growing hops in different regions. With the limited supply of New Zealand hops and their high demand, the industry may be at risk of food fraud and there is a need for rapid analytical methods to determine authenticity.
Hops grown in various geographical origins are expected to have a unique chemical fingerprint due to the soil, climatic conditions, and agronomic practices. This unique fingerprint could be used to trace the geographical origin using various fingerprinting methods. The commonly used methods to trace the origin of food samples are expensive, time-consuming and use numerous chemicals. Therefore, there is a need for a cheap, rapid and green method of verifying origin. This research investigated a rapid method combined with various machine learning models to predict the origin of New Zealand hops. Such methods could be useful in the industry to protect and authenticate hops for farmers, brewers or consumers.

S05
Presenting Author Taskeen Fatima
Authors Taskeen Fatima, Craig Bunt, Dominic Agyei, Biniam Kebede, Michelle Leus, Sarah Morris
Poster Title Characterisation of volatile compounds in commercially available Horopito and Kawakawa teas

Abstract
Native New Zealand plants - Horopito (*Pseudowintera colorata*) and Kawakawa (*Micropiper excelsum*) have been used by the Māori community for generations for medicinal, spiritual, and religious purposes. A popular method of consuming these plants' leaves was in the form of teas for their medicinal values. Currently, dried Kawakawa & Horopito leaves are available commercially in the form of loose tea leaf and tea bags for consumers to benefit from their individual properties. The main objectives of this study were to determine & characterize the presence and relative concentrations of volatile compounds present in commercially available Horopito & Kawakawa teas, and compare those findings to fresh leaf teas. Headspace Gas Chromatography & Mass Spectroscopy (HS GC-MS) was a suitable technique to quantify the classes of volatile compounds present in 1% w/v tea samples of four Kawakawa commercial teas, 0.5% w/v tea samples of three Horopito commercial teas and their equivalent concentrations of fresh & freeze-dried leaf teas and observe any significant differences between them. Commercial Kawakawa teas had a high content of Myristicin, an anti-inflammatory phenyl propene good for relaxation & pain relief while the major volatile compound class seen in Horopito teas was terpenes. It was found that smaller the particle size of the tea leaf, the higher the amounts of volatile compounds that were extracted into the teas. This also enhanced the sensory profile and flavour perception of the teas. Although commercially available tea leaves contain a higher quantity of myristicin than fresh tea leaves, it is suspected that they undergo flavour scalping as many more naphthalene compounds were found in their teas compared to fresh leaf teas. Further studies are needed to confirm & find better packaging solutions in the future.

S06
Presenting Author Xi Gong
Authors Xi Gong, Hannah Lee, Margaret Brennan, Martin Middleditch, James D. Morton
Poster Title Peptidomic analysis of anionic oat intestinal peptides.

ABSTRACT
Many studies have focused in recent years on the functional and nutritional properties of proteins in cereal and the bran and the bioactive attributes of peptides derived from these proteins. In vitro digestion model in combination with anion exchange chromatography isolates the cereal anionic intestinal peptides which, unlike cereal hydrophobic peptides, has not been proven to strongly relate to the bioactivity of peptides.
The aim of my PhD project is to identify the bioactive anionic peptides derived from the storage protein of cereal bran and to assess their bioactivity. The protein was extracted from oat bran, wheat bran and barley and was then subjected to in vitro digestion model. The intestinal digesta of oat bran protein showed highest overall antioxidant and ACE inhibitory activity and was fractionated by anion exchange chromatography, and the fractions of which with highest antioxidant and ACE inhibitory activity were selected for sequencing by R-HPLC-MS/MS. The peptides in the fraction candidates were identified. In addition, the most abundant peptides in the fraction candidates were identified and the relation of those abundant peptides to bioactivity was evaluated.
For future perspective, the ACE inhibitory peptide candidates will be analysed by molecular docking. The peptide will be selected for synthesis and assayed to confirm the discovery of the novel peptides. Meanwhile, it is interesting to bring the novel peptides to cell-line works and in vivo.

S07
Presenting Author Minyue Guo
Authors Minyue Guo, Shijie Tian, Kang Huang
Poster Title Catalase-immobilized biomimetic leaves as an indicator for verification of fresh produce sanitation

ABSTRACT
Sodium hypochlorite (NaClO) and hydrogen peroxide (H_2O_2) are commonly used sanitizer for washing and sanitation of fresh produce. However, there is a lack of process control and validation tools to directly assess the effectiveness of sanitizers in the washing process. This study aims to develop a real-time verification approach that can provide valuable feedback to adjust process conditions to reduce cross-contamination risks and minimize the use of sanitizers.

We fabricated micropatterned biomimetic leaves using soft lithograph, on which catalase was immobilized to represent bacteria attached to leaves. Structural changes in catalase immobilized on the leaf replica were assessed using Fourier Transform Infrared Spectroscopy (FTIR). These results were analysed using machine learning to predict the active concentrations of sanitizers used in the washing process. The results showed that different concentrations of NaClO and H2O2 treatments caused different degrees of change to catalase. Spectral data were analysed by variable selection methods - competitive adaptive reweighted sampling (CARS), linear support vector machines (SVM), nonlinear SVM with radial basis function (RBF), decision trees and partial least squares discriminant analysis (PLS-DA) to develop predictive models for predicting sanitizer concentrations and bacteria inactivations. The CARS-PLSR model has the highest accuracy, it predicted both the effective sanitizer concentration level and bacterial reduction with 100% in both training and prediction sets for NaClO, and 95% in training set and 86% in the prediction set for H_2O_2. Overall, this study illustrates that catalase can be used as a surrogate for verification of the efficacy of fresh produce washing step.

S08
Presenting Author Elizabeth Ham
Authors Elizabeth Ham, Leo Vanhanen
Poster Title Alternative plant based fining agents for beer

ABSTRACT
Clarity is an important visual characteristic of many types of beer. Non-biological chill haze is caused by interactions between proteins and polyphenols. To reduce this haze, fining agents are added to beer. These traditional fining agents such as gelatine often come from animal sources. Alternatively, there is increasing interest in non-animal-sourced fining agents that are environmentally sustainable while also being suitable for vegans and vegetarians. In this study, six alternative fining agents for beer from various upcycled plant and microbial sources were assessed. Out of all the alternative fining agents assessed, the mushroom was shown to be the most effective at reducing chill haze. While white grape marc was only slightly effective at higher doses. However, none of the samples assessed was as effective as gelatine at reducing chill haze. Other components introduced to the beer from the alternative fining agents may be interfering with their fining potential, and in some cases inducing the chill haze in the beer.

S09

Presenting Author Thilanka Haththotuwa

Authors Thilanka Haththotuwa, Alaa El-Din Bekhit, Pabodha Wththasinghe, Jie Gao, Yakun Hou, George Dias

Poster Title The Impact of novel sheep wool-derived dietary keratin protein (KDP) on Gut Microbiota

ABSTRACT

Proteins play a key role in shaping the composition of gut microbiota, which subsequently impacts health. Gut microbes are involved in the digestion, absorption of dietary proteins and transformation of amino acids into numerous microbial metabolites. Dietary protein serves as the nitrogen source and pH regulator for gut bacteria. Keratin-derived protein (KDP) is a novel dietary protein extracted from sheep wool. A preliminary 95-day rat feeding trial concluded that KDP, at 50% substitution of casein protein of the feed, is safe cost-effective, with normal growth performance. KDP significantly lowered plasma cholesterol and LDL-C contents and resulted in normal liver functions profile. Limited studies have investigated the effects of dietary keratin on the gut microbiota. We hypothesize that feeding KDP alters the rat gut microbial population leading to the above beneficial effects. Thus, a total of fifty-seven (n=57) gut samples were obtained from the duodenum, Jejunum and ileum of control group rats (n=10) fed with a casein-based (CAS) diet and experimental group (n=9) fed with Keratin modified standard rodent diet with the KDP and casein contributing 50% of the required protein each. The gut microbiota was profiled by high-throughput 16S microbiota sequencing. Results revealed significant changes in the relative abundance of certain bacterial genera in KDP fed group ($P < 0.05$). KDP fed group had a significantly high abundance of phylum proteobacteria, bacteroidota and a low abundance of phylum firmicutes. There was a parallel reduction of microbial genes such as *lactobacillus* and *bifidobacterium* producing short-chain fatty acids, cholesterol and triglycerides that have been suggested to contribute to human obesity, cardiovascular disease, type 2 diabetes and colorectal cancer. KDP fed group also had a higher abundance of beneficial bacteria such as *Lactococcus, Streptococcus, Bacteroides, Enterococcus* and *Actinomyces*. In conclusion, feeding keratin could create a microbial community that benefits host health. However, further human and animal studies are necessary to investigate the sustainability of results.

S10
Presenting Author Ari Hayati
Authors Ari Hayati, Dominic Agyei, Indrawati Oey
Poster Title Free amino acid profiles of trevally frames: an insight into their utilisation

ABSTRACT
Nearly 75% of fish are ended up as by-products after processing. In reducing food waste and achieving sustainable fish production, the utilization of fish by-products must be encouraged. Understanding the composition of free amino acids (FAAs), affecting flavour and food safety, is crucial to provide better insights for waste management and the concomitant process design. The filleting by-product (frames) of Trevally (*Pseudocaranx dentex*), a popular fish species in New Zealand, were analysed for the proximate analysis and free amino acids composition. Trevally frames were found to be rich in components and nutrients such as water (66.63%), protein (15.73%), lipid (10.35%), and minerals (6.73%). The total free amino acids content was 11.20 mg/g fish frame, with total essential amino acids (7.67 mg/g) higher than the non-essential amino acids (3.53 mg/g). Histidine was a major component, accounting for more than 30% of the total free amino acids, followed by 7% of lysine and alanine. According to the taste activity value (TAV) method, histidine, glutamic acid, valine, lysine, and alanine were identified as the taste-active components (TAV>1) and had a significant impact on the flavour. Histidine, lysine, and valine confer bitter tastes. Glutamic acid contributes to a strong umami taste, while alanine contributes to a sweet taste. Histidine and lysine are two amino acid precursors of biogenic amines (e.g., histamine, cadaverine, and putrescine). Despite the high nutrition, the high level of histidine, the precursor for histamine, poses an allergy concern in susceptible individuals.

S11
Presenting Author Ruchita Rao Kavle
Authors Ruchita Rao Kavle, Ellenna Tamsin Maree Pritchard, Alan Carne, Alaa El-Din Ahmed Bekhit, James D. Morton, Dominic Agyei
Poster Title A Comparative study of Huhu and Sago Grubs' protein, nutrition and food technology implications.

ABSTRACT
Edible insects and their juvenile forms have recently been recognised as potential alternative foods rich in nutrients such as lipids, carbohydrates, and protein. Aside from their nutritional benefits, proteins play a crucial role in defining food quality in relation to nutrition and technological functionalities, including foaming, gelling, emulsification, and

the oil- and water-holding capacity. *Prionoplus reticularis* (or huhu grubs) are edible insects unique to New Zealand, and pre-processed *Rhynchophorus ferrugineus* (or sago grubs) are a commercially available edible insect from Thailand. Although edible insect research has steadily increased in the past decade, there is no comprehensive information on the amino acid profiles and functionalities of protein extracts from huhu grubs and pre-processed sago grubs. This study extracted the protein by alkaline extraction and isoelectric precipitation. The amino acid composition was determined using an HPLC method based on fluorescence detection. The foaming capacity and emulsion stability were assessed using homogenised samples over a 60 min and 150 min timeframe, respectively. Total essential amino acid (EAA) contents of 386.7 and 223.2 mg/g protein were found for HLPE and SLPE, respectively. SLPE (1% w/v) exhibited a foaming capacity of 87.3%, higher than that of HLPE (50.7%) at 150 min. HLPE and SLPE (1% w/v) exhibited emulsifying stability of 96.8% and 98.8% after 60 min. Protein extracts from huhu larvae and sago larvae are of good nutritional quality (based on EAA content). Both protein extracts demonstrated comparable emulsification potential, but better foaming stability was found with the SLPE, suggesting better potential for certain food technology applications.

S12
Presenting Author Qimou Li
Authors Qimou Li, Meng Wai Woo, Marco P. Morgenstern, Siew Young Quek
Poster Title Improve extrusion 3D food printing using a special ohmic heating system

ABSTRACT
The aim of this study was to explore a novel technique to achieve in-situ heating during 3d food printing by embedding ohmic heating device. A special ohmic heating device was designed which uses the printing nozzle and printing base as the electrodes of ohmic heating system. Experiments and numerical studies were carried out based on a static extrusion system to evaluate the feasibility of this heating method. Results showed that the ohmic heating system could rapidly heat the dough and mashed potato above 60 ℃ within 20 to 30 s. Appearance and texture changes including surface browning, solidification and burning were observed for both the dough and mashed potato sample during ohmic heating. With the temperature profile recorded by the infrared camera, the heating kinetics was investigated and an ohmic heating model was developed using COMSOL Multiphysics. The heating rate was found to be strongly correlated to ion concentration, electrical potential and the geometry of the heating matter. In contrast to conventional parallel flat plate systems, this new ohmic heating system has a highly-localized temperature distribution which was rarely studied. We also observed a temperature limitation cap in this heating system not reported before in

the literature. To better simulate the 3d printing process, the next step of this study is to evaluate the ohmic heating efficiency in a dynamic system with continuous nozzle moving and extruding during ohmic heating.

S13
Presenting Author Yijun Liu
Authors Yijun Liu, Boyang Xu, Yingxin Li, Kang Huang
Poster Title Sustainable and self-cleanable "ice cubes" for reducing microbial cross-contamination throughout the cold chain

ABSTRACT
Temperature abuse in the cold chain can lead to microbial food spoilage, resulting in significant food waste and economic loss. This project aims to develop reusable, non-melting, and self-cleanable “ice cubes” to facilitate temperature control and minimise microbial cross-contamination in the cold chain. This was achieved by using green-synthesised cellulose-based hydrogels combined with food-grade photosensitisers. Cellulose hydrogels were synthesized by crosslinking citric acid and CMCNa/HEC cellulose. The composition optimisation results indicated that the cationic hydrogel obtained by using 10%w/w citric acid and 4%w/w cellulose (CMCNa:HEC = 3:1) showed better mechanical properties and higher efficiency in absorbing food-grade photosensitisers, compared to anionic hydrogels. The mechanical properties of cellulose-based hydrogels remained stable after 10 cycles of freezing-thawing cycles. The hydrogel-based ice cubes exhibited comparable cooling capacity, cooling efficiency, and water-holding ability compared to traditional water-based ice cubes. The cellulose hydrogel is super compressible, facilitating low-cost transportation and storage. It remained the water-absorbing ability after compression to one tenth of its original volume and vacuum storage for four weeks. The results also demonstrate that the water-absorbing ability was not affected significantly after 10 simulated dehydration and rehydration cycles. After absorbing food-grade photosensitiser Erythrosine B (EB), the hydrogel exerts strong photo-induced antimicrobial activity. The EB-absorbed hydrogel ice cubes can kill 6 logs of Listeria spp. on the surface after one-hour irradiation of LED daylight. In summary, the developed food-grade, reusable, non-melting, and self-cleanable hydrogel-based “ice cubes” can potentially reduce water consumption in the food supply chain and food waste by controlling microbial cross-contamination.

S14
Presenting Author Ana Carolina Marshall
Authors A.C. Marshall, N. Lopez-Villalobos, S.M. Loveday, M. Weeks, W. McNabb
Poster Title Milk coagulation properties of dairy sheep in a New Zealand flock

ABSTRACT
This study was the first to characterize cheese-making properties of milk from individual dairy sheep in New Zealand. The aim of this study was to estimate partial correlations among processability and composition traits. A total of 521 records were obtained from a flock of 169 ewes milked once-a-day, from 50 to 182 days of lactation, during the 2021-2022 production season. The traditional milk coagulation properties (MCPs) obtained after rennet addition included rennet coagulation time (R), time to reach curd firmness of 20 mm (K20), and curd firmness at 30 minutes (A30). Cheese yield was also measured on individual milk samples. Stage of lactation affected the properties of milk for cheese making. With the advancement of lactation, the milk rennet coagulation properties declined. Therefore, it is preferable to produce cheese in the earlier stages of lactation rather than in late lactation for better cheese quality. Better MCPs were strongly associated with lower milk pH in earlier stages of lactation. Whilst MCPs worsened towards the end of lactation, higher relative cheese yield was achieved towards the end of lactation, due to higher contents of fat and protein in milk. Cheese yield was strongly correlated to fat in the earlier stages of lactation, whereas in the late stage of lactation, cheese yield was strongly correlated to fat and protein, and strongly negatively correlated to milk urea. Cheese yield and MCPs were weakly associated. The large variation between animals in this flock indicates potential for genetic selection of animals on cheese processing characteristics of milk. Further studies are needed to define heritability and genetic correlations for these traits in New Zealand dairy sheep.

S15
Presenting Author Linda Nezbedova
Authors Linda Nezbedova, Tony McGhie, Mark Christensen, Julian Heyes, Noha Ahmed Nasef, Sunali Mehta
Poster Title Effects of Monty’s Surprise apple consumption on acute antioxidant capacity and postprandial glucose: A randomised control crossover trial.

Monty’s Surprise (MS) is a heritage apple cultivar discovered in New Zealand with high phytochemical concentrations. Several studies have reported that apple phytochemicals can help regulate blood glucose, improve glucose uptake in

cells, and reduce oxidative stress, which is implicated in developing chronic diseases. This study investigated the impact of MS apple puree consumption on human plasma antioxidant activity and glucose levels.
Twelve healthy male and female participants received either 500 g of apple puree or a macronutrient-matched placebo in a randomized crossover human study. Blood samples were collected at baseline after overnight fasting and at regular intervals up to 8 hours post-meal consumption. Plasma samples were examined for postprandial glucose and total antioxidant activity using Ferric Reducing Antioxidant Power (FRAP).
MS apple puree consumption significantly increased the total antioxidant capacity of plasma compared to the placebo group ($p < 0.05$). The mean FRAP values of the apple puree group increased from baseline to 170.78 μmol/L at 30 minutes, while the placebo group showed no significant change (from the baseline to 24.26 μmol/L at 30 minutes). Moreover, apple puree consumption led to significantly lower ($p < 0.05$) glucose levels in plasma (0.55 mmol/L) compared to the placebo group (1.20 mmol/L) 15 minutes after meal consumption.
This study demonstrated that MS apple consumption increased the antioxidant capacity and decreased glucose levels in plasma. These findings suggest that consuming MS apple could be a promising dietary strategy to reduce oxidative stress and prevent chronic disease development.

S16
Presenting Author Sahiti Peddisetti
Authors Hannah Lee, Sahiti Peddisetti, Kelly-Anne Bentley, Isobel Pope, Jessica Hampton, Lovedeep Kaur, Jaspreet Singh, James Morton
Poster Title Design and analysis of novel 3D printed foods with re-purposed animal and plant proteins.

ABSTRACT
Food Transition 2050 describes the need for New Zealand to diversify its food products. This has led to an increased interest in evaluating new food applications for animal, plant, fungal and microbial proteins. One of the approaches to increase available protein is to reduce food wastage and fully utilize existing animal and plant-based proteins by improving the functional and nutritional value of side streams from the food industry. Often these have either poor texture or visual appeal. 3D food printing technology offers the opportunity to turn these side streams into complex shaped foods with increased functional and nutraceutical value.
With the insights on 3D food printing technology and the newly installed in Lincoln University, The current project uses 3D Foodini food printers (manufactured by Natural Machines) to develop the tools and prototype processes that will allow the industry to gain greater value from the NZ resource base by producing new-to-NZ protein ingredients and

foods. Our team has successfully established animal protein based (meat or dairy), pea protein based and hybrid (pea-meat; pea-dairy; pea-dairy-meat) 3D printed foods, and then determined their textural and rheological properties of these 3D printed protein constructs. These attractive 3D printed soft-textured protein-rich products will be particularly useful to people with special dietary requirements like dysphagia and geriatrics.

S17
Presenting Author Haroon Qazi
Authors Haroon Jamshaid Qazi, Aiqian Ye, Alejandra Acevedo-Fani, Harjinder Singh
Poster Title Impact of differently structured starch gels on the gastrointestinal fate of curcumin-containing nanoemulsions

ABSTRACT
Starch-based foods offer an interesting platform for the fortification of bioactive compounds, as they can be formulated into different matrices and textures. In this study, we report on the microstructure, physicochemical properties and in vitro gastrointestinal digestion of curcumin-nanoemulsion-loaded corn starch gels formed using starches with different amylose contents, i.e. waxy (WCS), normal (NCS) and high amylose (HACS) corn starches. The incorporation of curcumin nanoemulsion (CNE) into the gels had a significant impact on their initial physicochemical properties. In the gastric phase, the disintegration and emptying of the WCS+CNE gel from the stomach was slow because of the high adhesive nature of the gel, which entrapped most of the curcumin-loaded oil droplets within the gel fragments. In contrast, the NCS+CNE and HACS+CNE gels demonstrated significantly faster gastric emptying of the gel fragments and associated CNE. This variation in the compositional and structural profile of the gastric digesta was further linked to the different rates of starch hydrolysis, the release of free fatty acids and the associated bioaccessible fraction of curcumin. This study demonstrated that the oral–gastric digestion of these starch gels was more dependent on the gel structures rather than on the molecular properties of starch. The dynamic gastric environment resulted in the formation of distinct gel structures, which significantly influenced the composition and microstructure of the emptied digesta, further affecting starch hydrolysis and curcumin bioaccessibility in the small intestine.

S18
Presenting Author Aylin Sen
Authors Alyin Sen, Harjinder Singh, Aiqian Ye, Alejandra Acevedo-Fani
Poster Title Emulsification potential of coconut oil body membranes

ABSTRACT
The interfacial biomaterials from plant oil bodies (OBs) are called OB membrane materials (OBMMs), which can be used as emulsifiers. Coconut was chosen as a model system to understand what is happening during the extraction of OBs and OBMMs. After diverse washings of OBs, the non-membrane proteins were found to be strongly associated with the oil body membrane through hydrophobic and electrostatic interactions. After harsh washings, the main OBMM proteins, oleosins, were identified at 11 kDa by SDS-PAGE. To obtain OBMMs, two natural and solvent-free methods were chosen. These methods are based on shear or temperature alterations, including subsequent lipid removal, and OBMM collection. Temperature dependent process was more effective in destabilizing the OBs because the membrane was more prone to the physical stress applied by temperature than shear. To increase the efficiency, this process was repeated, resulting in an OBMM fraction with good emulsification properties. However, compared with commonly used plant emulsifiers, such as soy lecithin and pea protein, OBMMs had poor emulsification properties, mainly because of droplet flocculation. It was hypothesized that the oil body membrane breaks as fragments, and these fragments adsorb to the droplet surface, leading to flocculation. In the future, the state of the broken membrane will be analysed, and new OBMM extraction methods will be explored. Further functionality studies will be carried out to determine the applicability of these OBMMs in food systems.

S19
Presenting Author Vitor Silva
Authors Vitor Silva, Warren McNabb, Nicole Roy, Clare Wall, Nick Smith, Jane Mullaney
Poster Title Modelling the influence of foods on the colonic microbiome

The colonic microbiota strongly influences host health. Among the factors that shape the composition and function of this microbial community, diet is key. Therefore, determining foods that positively modulate the colonic microbiome is crucial to promote human health. Here, genome-scale metabolic models simulated the effect of foods on the colonic microbiome of humans, selecting food candidates for further investigation based on the outcome predictions of

microbial growth rate and fluxes of produced metabolites. In short, this research advances the understanding between the colonic microbiome and the host diet.

S20
Presenting Author Khush Soni
Authors Khush Soni, Biniam Kebede, Russell Frew
Poster Title Employing stable isotopes and trace elements to trace soybean origin sourced from deforestation hot stops

ABSTRACT
Due to its outstanding nutritional profile, health benefits, and affordability, soybean production has experienced a remarkable growth of around 2000% since 1960, with South America accounting for 50% of this production and Brazil as the largest producer and exporter. Despite its popularity, the production of soybean has been associated with challenges such as adulteration and low-quality products, as well as environmental degradation resulting from the destruction of fragile ecosystems such as the Amazon and Cerrado. Although laws have been enacted to prohibit deforestation in these sensitive areas, there is still no direct and effective means of determining whether the crop was sourced from recently deforested lands. Our study aimed to develop a routine model for discriminating soybeans sourced from six Brazilian states within deforestation hotspots. To achieve this, we used conventional analytical techniques, including isotope ratio mass spectroscopy (IRMS) and inductively coupled plasma mass spectroscopy (ICP-MS), in combination with partial least squares discrimination analysis (PLS-DA). The PLS-DA model was able to successfully discriminate and classify soybean from the six regions in Brazil, demonstrating its potential as an effective tool for tracing soybean production. Therefore, this study highlights the suitability of the this model for routine discrimination of soybean from various regions and to improve traceability and ensure compliance with environmental regulations.

S21
Presenting Author Shijie Tian
Authors Shijie Tian, Huirong Xu, Kang Huang
Poster Title Non-destructive measurement of kiwifruit firmness using acoustic vibration and bulk optical properties

ABSTRACT
Firmness is an important quality indicator of kiwifruit and is useful for determining the optimal marketing time and optimizing storage management. This study developed non-destructive approaches to measure the firmness of kiwifruit based on acoustic vibration and bulk optical properties. Regarding the acoustic vibration based approach, a highly integrated excitation device was designed to impact the kiwifruit and automatically collect the resulting acoustic vibration signal. The signal was first transformed from the time domain to the frequency domain, and then 10 statistical features were extracted. Eight of them had good correlations with kiwifruit firmness, which proved the feasibility of firmness prediction. Furthermore, the partial least squares regression (PLSR) combined with the competitive adaptive reweighted sampling (CARS) algorithm was used to conduct regression analysis on the acoustic vibration frequency domain spectrum, and high-precision firmness prediction was achieved (R^2=0.96, RMSEP=0.27N). Another non-destructive measurement based on bulk optical properties was developed using a single integrating sphere system. By combining the spectral information of kiwifruit flesh collected by the system and the inverse adding-doubling algorithm, kiwifruit's absorption coefficient and reduced scattering coefficient (μ_s') were evaluated. In the wavelength range of 500–1050 nm, the μ_s' showed a good correlation with firmness, and decreased with the decreasing firmness. The CARS-PLSR model based on μ_s' also achieved high-precision firmness prediction (R^2=0.97, RMSEP=0.03N). This study provides an effective reference for firmness prediction by reduced scattering coefficient and acoustic vibration.

S22
Presenting Author Xintong Xu
Authors Xintong Xu, Boyang Xu, Kang Huang
Poster Title Anthocyanin-bentonite composite enables enhanced thermal stability and reversible pH-responsive colour change

ABSTRACT
Anthocyanin exerts beneficial antioxidant, antibacterial, and pH-responsive properties; thus, it has been considered as an excellent natural pH indicator. Given the fact that anthocyanin forms at least four different chemical structures in an acidic condition, it is necessary to construct reversible reactions for indicating pH changes. However, the molecular structure of anthocyanin is highly unstable and can be influenced by pH and temperature conditions in complex food systems, which has hindered their real-life applications in the food industry. Based on the unique properties of clay (e.g., adsorption capacity and chelation of ions), montmorollonite can address those limitations when applying anthocyanin as a pH indicator. The presented work aims to develop a reusable and food-grade pH indicator for determining food freshness. To achieve this target, we will extract and purify anthocyanin from red cabbage, and absorb it with bentonite to stabilise the synthesised crystals, followed by the incorporation of anthocyanin composite into a calcium alginate/gelatine hydrogel. Our outcomes suggest that by changing the pH range from 3.0 to 10.0, the anthocyanin composite changed its colour from pink to green/yellow. The essential variation was observed in the pH range from 7.0 to 10.0, which is vital for determining the freshness of the food that has been oxidized/alkalized. The outcomes also suggest that the optimal formulation of bentonite-incorporated hydrogel was composed of 30% gelatin: 10% alginate in the 2:1 ratio. Success of this work demonstrates the feasibility of using a food-grade, reusable pH indicator for real-time monitoring of the freshness of packaged foods.

S23
Presenting Author Rebecca Yang
Authors Rebecca Yang
Poster Title Effect of smokehouse conditions on transfer of odour active compounds and pahs in culinary smoke

Smoked food products made from New Zealand Kānuka and Mānuka woods have distinct flavour characteristics sought after by consumers. However, the control of flavour characteristics and accumulation of harmful polycyclic aromatic hydrocarbons (PAHs) depends on the smokehouse conditions during smoking. This study aims to understand how smoking time and smokehouse temperature influence the transfer of odour active compounds and PAHs to food using defined culinary smoke and a model food system. A factorial experimental design was used to evaluate smoking time and smokehouse temperature (independent variables) at two smoke generation temperatures (350˚C and 480˚C). Volatile compounds in the smoked food model were analysed using gas chromatography mass spectrometry. The results will assist in designing smokehouses and assist food manufacturers in improving the safety and quality of smoked food products.

S24
Presenting Author Dinesha Katugampala
Authors Dinesha H. Katugampala, Emma Sherman, Farhana Pinu, Lisa I. Pilkington, Rebecca E. Jelley, Bruno Fedrizzi
Poster Title Impact of ethanol on chemical composition and sensory profile of Pinot noir wines

ABSTRACT
The aim of the study was to investigate the perception that low-alcohol Pinot noir wines, despite their increasing popularity among consumers, are of inferior quality. Pinot noir wines with varying alcohol content levels of 9.5%, 12.5%, and 14% were examined to determine the impact of alcohol on their volatile chemistry and sensory perception. A non-targeted static headspace-gas chromatography (HS-GC) was used to identify 150 volatile compounds, including alcohols, esters, terpenes, and aldehydes. The study found that ethanol affected the relative contribution of volatile compounds differently. Specifically, esters and acids were found to be higher in head space concentration in wines with greater alcohol content. Expert tasters evaluated the wines for quality, aroma, and flavour attributes, and the study found significant differences in the volatile profiles and sensory attributes among the three wines. Lower alcohol content wines were found to have more savoury aromas and vegetal flavours. Wines with 12.5% ethanol content were described as having higher fruit ripeness flavour and fuller body, while wines with 14% ethanol content were higher in

sweet taste, dark fruit flavour, and full length. Changes in ethanol concentration had a greater impact on in-mouth properties than on aroma attributes, and the perceived quality of low-alcohol wines was significantly lower than that of the higher alcohol wines. These findings provide insight into the effects of alcohol content on the chemical and sensory profiles of Pinot noir wines, which can aid both winemakers and consumers in selecting wines.