APFAN Asia Pacific Food Analysis Network

Universiti Kebangsaan Malaysia The National University of Malaysia

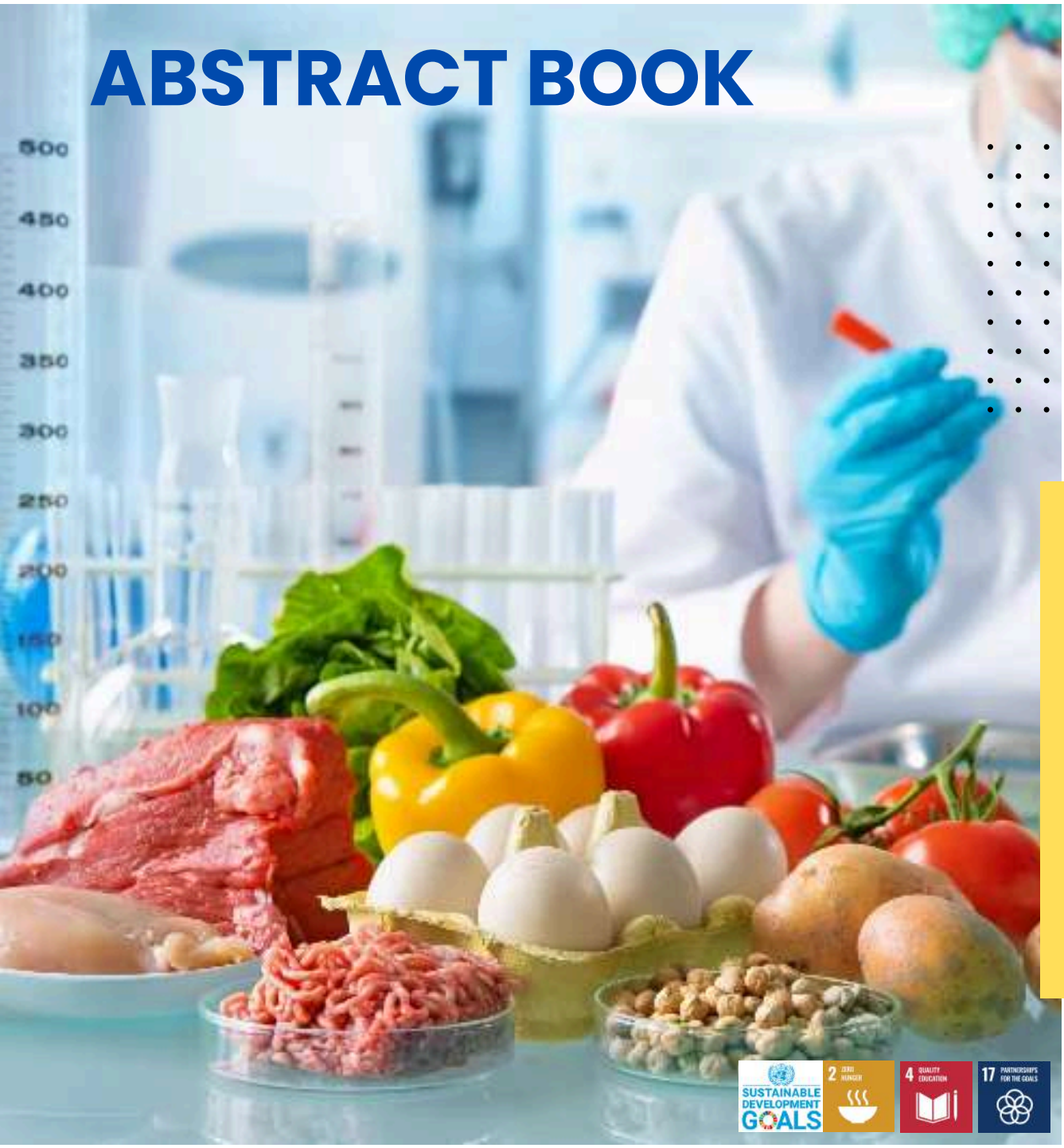
H CARE Centre For Healthy Ageing & Wellness

KIMIA MALAYSIA

IN ASSOCIATION WITH:

AOAC International Southeast Asia Section

ABSTRACT BOOK



APFAN Asia Pacific Food Analysis Network

International Workshop on Advancing Food Analysis, Safety and Testing Standards for Global Comparability

15-17TH JULY 2024 | PUTRAJAYA, MALAYSIA

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APFAN WORKSHOP 2024 OVERVIEW

About Us

The Asia Pacific Food Analysis Network (APFAN), in partnership with Universiti Kebangsaan Malaysia (UKM) and Department of Chemistry Malaysia (KIMIA) is organizing the APFAN PT4 Workshop entitled: “International Workshop on Advancing Food Analysis, Safety and Testing Standards for Global Comparability”. The three-day workshop is scheduled for 15-17th July 2024.The workshop will be held at The Everly Hotel located in Putrajaya, an "Intelligent Garden City" and the federal administrative capital of Malaysia.

MISSION AND VISION

Mission

APFAN's mission is to serve the needs of food analysts in their dual roles to achieve food quality, food safety and good nutrition and to promote food trade in the Asia Pacific region. APFAN helps its members to maintain and improve their abilities in food analysis and this is achieved by developing a network of food scientists and food technologists that encourages the sharing of ideas, concepts and methods through on-line communication and face to face meetings.

Vision

APFAN's vision is to create a stable and peaceful Asia Pacific region where its people benefit through improved health and prosperity. APFAN seeks to achieve equivalence' of standards between economies in both food safety and food trade systems, thereby strengthening food security in the region.

PREFACE BY APFAN COORDINATOR

On behalf of the APFAN Committee, and the PT4 Workshop Organising Committee, I welcome you to Putrajaya, the seat of the federal government of Malaysia. Putrajaya is known as the Garden City, with its lush greenery, but this modern city is also filled with many fun attractions, impressive buildings and unique landmarks that make it an exciting place to visit. You can go on the Putrajaya Cruise Tour, cycle at Putrajaya Botanical Garden, visit the Putrajaya mosques and cultural sites, go on a nature walk at Putrajaya Wetlands Park or have a picnic at Taman Saujana Hijau. For the more adventurous among us, you can try flyboarding at Marina Putrajaya, rock climb and skate at Putrajaya Challenge Park or even challenge yourself at District 21.

Or, you can simply plan a relaxing staycation at one of Putrajaya's best hotels. APFAN, the Asia Pacific Food Analysis Network, is a special project of the Federation of Asian Chemical Societies (FACS). APFAN was formed at the Third Asian Chemical Congress in Brisbane in 1989 and in 2024 we celebrate our 35th birthday. APFAN's mission is to serve the needs of food analysts in their dual roles to achieve food quality, food safety and good nutrition and to promote food trade in the Asia Pacific region. APFAN helps its members to maintain and improve their abilities in food analysis and this is achieved by developing a network of food scientists and food technologists that encourages the sharing of ideas, concepts and methods through on-line communication and face to face meetings. APFAN's vision is to create a stable and peaceful Asia Pacific region where its people benefit through improved health and prosperity.

APFAN seeks to achieve 'equivalence' of standards between economies in both food safety and food trade systems, thereby strengthening food security in the region. In recognition of the need to improve the proficiency and capabilities of regional food testing laboratories, APFAN is conducting a multi-phase project that produces and distributes Proficiency Testing (PT) materials free of charge to food analysis laboratories in the Asia Pacific region. Follow-up PT Workshops have been held in Indonesia (PT1) in 2018, in Thailand (PT2) in 2019 and in the Philippines (PT3) in 2023. At this PT4 Workshop in Malaysia, PT materials will again be distributed free of charge to participants. These Workshops discuss the PT results in detail, to enable the participant laboratories to improve their methodologies and adopt a more uniform approach to regional food analysis. By focusing on the practical aspects of the ISO/IEC 17025 Standard, Proficiency Testing, Reference Materials, and Workshops, this project will assist participants to identify, assess and implement actions that address any technical shortfalls of their organizations.

Many thanks go to the organizations and individuals who have contributed to the success of this PT4 Workshop, in particular, Universiti Kebangsaan Malaysia (UKM) and the Department of Chemistry Malaysia (KIMIA). I am also very happy to advise that GERHARDT MALAYSIA SDN BHD, WATERS ANALYTICAL INSTRUMENTS SDN BHD, MYCO2, BRUKER SINGAPORE PTE. LTD., SARTORIUS MALAYSIA SDN BHD, AGILENT TECHNOLOGIES SINGAPORE (SALES) PTE LTD, and BMS DIAGNOSTICS (M) SDN BHD., are the Sponsors for this PT4 Workshop. Please support them as they have supported us.

I look forward to further cooperation with you in the remaining activities of the current APFAN project and beyond as we realize our goal, which is to improve the proficiency and capabilities of food testing laboratories in the Asia Pacific region.

Yours sincerely,

Mr Stewart Jones
COORDINATOR APFAN
(ASIA PACIFIC FOOD ANALYSIS NETWORK)
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PROGRAMME

PROGRAMME AT A GLANCE

TIME	DAY 1
8:00 - 9:00	Registration
Welcome and Opening	
9:00 - 10:00	**Welcome Speech, Opening Remark, Officiate and Workshop Introduction**
	Session 1: Plenary Session
10:00 - 10:30	**Plenary 1: Food Safety and Quality**
10:30 - 10:45	Morning Break / Poster Viewing and Booth Visit
10:45 - 11:15	**Plenary 2: ISO/IEC 17043:2023 - What's New**
11:15 - 11:45	**Plenary 3: The Search for Better Separations for Your Food Analysis**
11:45 - 12:15	**Plenary 4: Recent Advances in Encapsulation Technologies**
12:20 - 13:10	**Session 2: AOAC Session**
13:10 - 14:30	Lunch
14:30 - 14:50	Company Introduction with Diamond and Gold Sponsorship
14:50 - 16:00	**Session 3: Oral Presentations - Method Validation and Measurement Uncertainty**
16:00	Afternoon Break
TIME	**DAY 2**
	Food Analysis and Microbiology
8:00 - 9:00	Poster Viewing and Booth Visit
9:00 - 10:00	**Session 4: Oral Presentations - Food Analysis**
10:00 - 10:20	Morning Break
10:20 - 11:20	Session 4 (Continue)
11:20 - 13:20	**Session 5: Oral Presentations - Advanced Food Analysis**
13:20 - 14:30	Lunch
14:30 - 15:40	**Session 6: Oral Presentations - Food Microbiology**
15:40 - 16:00	Company Introduction with Gold Sponsorship
16:00	Afternoon Break
17:00 - 19:00	**APFAN Annual General Meeting**
TIME	**DAY 3**
	Proficiency Testing and Reference Material
8:00 - 9:00	Poster Viewing and Booth Visit
9:00 - 10:40	**Session 7: Oral Presentations - Proficiency Testing and Reference Material**
10:40 - 11:00	Morning Break
11:00 - 13:00	**Session 8: Engagement Session for PT4 - ITDI, DOST**
13:00 - 13:10	Company Introduction with Gold Sponsorship
13:10 - 14:20	Lunch
14:20 - 14:30	Company Introduction with Gold Sponsorship
14:30 - 16:20	**Workshop - Statistical Methods for use in Proficiency Testing by Interlaboratory Comparison**
16:20 - 17:00	**Closing Ceremonies**
17:00	Afternoon Break

ABSTRACT

“Waving New Pathway in Food Analysis in Malaysia : Integrated Approach”

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Food safety is a global issue faced by the entire world. In preparation for an increasingly challenging food safety crisis, food analysis services need to be continuously strengthened. The evolving food safety issues and its challenges in Malaysia necessitate innovative approaches to food analysis landscape. Food analytics capabilities are critical in generating scientific evidence for food safety management options or measures. A total of five key issues and challenges have been identified and require a holistic and coordinated strategy. The capacity to analyse food is still limited when compared to the requirements that were established by national and international legislations. The failure of laboratories to satisfy the necessary sensitivity thresholds is one of the many obstacles and hurdles that further contribute to these issues. Other challenges and barriers include a shortage of experienced analysts, increased expenses for analysis, malfunctioning equipment that results in expensive repairs and maintenance, and a lack of skilled analysts generally. The National Food Laboratory Analysis Framework was designed with the intention of elevating the quality of analytical services to provide accurate and reliable analytical outcome and meet its main objective in complying the national and international requirements. The proposed integrated approach synergizes advanced analytical techniques, data-driven insights, and collaborative frameworks to provide a comprehensive solution for food analysis in the country. By leveraging cutting-edge technologies such as mass spectrometry, chromatography, and molecular biology, alongside robust data analytics and machine learning algorithms, this approach aims to deliver wider coverage with more accurate, efficient, and timely results. The approach also emphasizes the importance of cross-disciplinary collaboration, involving stakeholders from government agencies, academic institutions, and private laboratories. This collaboration is crucial for developing standardized protocols, ensuring regulatory compliance, and fostering innovation in food safety practices.

Multidimensional separation for improved analysis of volatile compounds in your food samples

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Mulltidimensional analysis (MDA) combines more than one dimension of analysis. E.g.; GC–MS hyphenates GC separation, with MS mass measurement of ionised compounds. GC–MS has served the community well for molecular interpretation of many sample types, but this excellent technique may fail to separate much of the sample – the number of sample components exceeds the peak capacity of the separation system. For multi-component (complex) samples, we need more separation power. Multidimensional GC (using 2 – i.e. 1D and 2D – or more columns) is well-known and uses 2 columns of different chemical nature (i.e., different polarity); e.g.; for analysis of chiral compounds we use an enantioselective 2D column. MDGC is excellent for target analysis of a (few) discrete region(s) of a primary column separation. MDGC is generally not suitable for untargeted analysis. Here we evaluate comprehensive two-dimensional GC (GC×GC) as an excellent higher resolution (up to 10-fold improved separation) untargeted analytical method for volatile compounds.

Cryogenic modulation for GC×GC is described, improving sensitivity up to 10-20-fold. Greater mass spectrum precision for GC×GC-MS is due to reduced matrix interferences. GC×GC has a unique structured separation. The 2-dimensional plot provides information about chemical properties of molecules. GC×GC delivers to the analyst many desirable attributes – and exactly what the natural progress in GC technology should address. This presentation introduces MDGC and GC□GC technologies, highlights benefits of GC×GC for total sample analysis, and improved quantification for e.g.; metabolomics. Case studies include fatty acid (FAME) analysis; flavour, essential oil and hop analysis, and some unusual analytical GC results that are revealed when GC×GC is used which cannot be identified in 1D GC analysis.

The super-resolution technique of GC×GC provides a new capability for food analysts to fully resolve their volatile mixtures.

Keywords: MDGC; GC×GC; Volatile compounds; High-resolution separation; Untargeted analysis

Microencapsulation for formulation

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Microencapsulation is a process in which tiny particles or droplets are surrounded by a coating or embedded in a homogenous and heterogenous matrix. This process allows researchers or industrialists to produce capsules or powder with small sizes ranging from micrometres to nanometres.

The main purposes of employing microencapsulation techniques are to protect sensitive active ingredients from degradation and allowed controlled or targeted release of active ingredients into desired sites. The ingredients used in microencapsulation process can be categorized as core materials and wall materials. Core materials could be made up of the active and supporting ingredients; while wall materials are usually polymeric materials that is used to entrap or embed the core materials for protection. Different types of microcapsules could be formed with different encapsulation techniques. Matrix encapsulation refers to microcapsules with active ingredients dispersing within and on the surface of the wall materials. On the other hand, reservoir encapsulation refers to microcapsules with active ingredient surrounded by the wall materials. Examples of microencapsulation techniques are extrusion, co-extrusion, emulsification, coacervation, spray-drying, and freeze-drying. The microencapsulation process could be applied in different industries such as food, feed, pharmaceutical, skin care, cosmetic, and fertilizers. This presentation provides several examples of the active and supporting ingredients in core materials, as well as examples of biopolymers used as wall materials for the microencapsulation process. Common encapsulation techniques and their usage in various formulation for different applications will be discussed. The research findings may provide more insights on the applicability and suitability of the microencapsulation techniques for different active ingredients. It also highlights several considerations in selecting the microencapsulation techniques for different formulation and applications. Lastly, emerging encapsulation technologies will be briefly introduced and the future trends of microencapsulation in different industries will be presented.

ISO/IEC 17043:2023 - What's New

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This document specifies general requirements for the competence and impartiality of proficiency testing (PT) providers and consistent operation of all proficiency testing schemes. This document can be used as a basis for specific technical requirements for particular fields of application. Users of proficiency testing schemes, regulatory authorities, organizations and schemes using peer-assessment, accreditation bodies and others can use these requirements in confirming or recognizing the competence of proficiency testing providers.

Laboratory Capacity Building in the Asia Pacific

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The Asia Pacific region is home to 60 percent of the world's population and it conducts 42 percent of the world's trade. The need to achieve equivalence of standards between economies in the region, particularly in the areas of food trade, food safety and food analysis is evident

International laboratory quality guidelines were first socialised in the 1980s but only became a formal ISO (International Standards Organisation) standard in 1995 as ISO/IEC 17025. Laboratory capacity building efforts are now focussed on continual progress into method validation and estimation of measurement uncertainty, traceability of measurement and harmonisation of methods.

APFAN was established in 1989 and its mission is to serve the needs of food analysts in their dual roles (i) to achieve food quality, food safety and good nutrition and (ii) to promote food trade in the Asia Pacific region, thereby strengthening regional food security. APFAN is currently conducting a multi-phase project that produces and distributes Proficiency Testing (PT) materials free of charge to food analysis laboratories. Follow-up Workshops discuss the PT results in detail, to enable the participant laboratories to improve their methodologies and adopt a more uniform approach to regional food analysis.

The Association of Official Analytical Collaboration (AOAC) was originally founded in 1884 and AOAC International's mission is to advance food safety and product integrity through standards, validated test methods, and laboratory quality programs. Many laboratories in the Asia Pacific region use the analytical methods published in the AOAC International's Official Methods of Analysis. In June 2021, the AOAC South East Asia Section was formed with member countries; Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Timor-Leste, Vietnam and now Thailand. The new Section has five Working Groups on Capacity Building, Emerging Issues, Harmonization of Methods, Microbiology, and Training of Young Scientists.

It is hoped that future cooperation with the AOAC South East Asia Section, together with the development of an AOAC South West Pacific Section, will result in some specific guidelines for laboratories to adopt uniform methodology across the Asia Pacific region.

Keywords: ISO/IEC 17025, APFAN, AOAC, proficiency testing, reference materials, method harmonisation.

Food Residue Testing in Australia

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National Measurement Institute Australia (NMIA)

The National Measurement Institute Australia (NMIA) plays an important role in the Australian economy and community by leading, maintaining, and regulating Australia's measurement system. NMIA represents Australia in both the CIPM (International Committee of Weights & Measures) and OIML (International Organisation of Legal Metrology).
NMIA is a member of the Australian Technical Infrastructure Alliance along with three other organisations: Standards Australia, the National Association of Testing Authorities (NATA), and the Joint Accreditation System of Australia and New Zealand (JAS-ANZ). NMIA also provides proficiency testing programs to local and international laboratories. These PTs include fresh fruits, vegetables, and potable water for pesticides and polyfluoroalkyl substances (PFAS). NMIA also establishes chemical reference values and develops Certified Reference Materials (CRMs), for example, for endosulfan sulfate in tomatoes. One area of NMIA's responsibilities includes metrology associated with food safety, including maintaining measurement capabilities for residue testing. These capabilities include analysis of residues such as pesticides, herbicides, fungicides, rodenticides, antibacterial and antiparasitic agents, toxins, pathogens, and allergens in food. Currently, NMIA conducts its testing based on classes of compounds and their chemistry. It uses a range of extraction and purification techniques such as QuEChERS, Chem Elute, and static and dynamic headspace, among others. The measurement techniques employed include LC-MS/MS, GC-MS/MS, and LC-QTOF-MS (for unknown compounds and investigations). As examples, NMIA monitors 8 classes of antibiotics in animal tissue, screens and monitors over 250 pesticides in fresh and processed foods, and monitors for paralytic shellfish toxins, aflatoxins, biogenic amines, and specific allergenic proteins to address national requirements. In this talk, the steps involved in some of these methods and techniques will be discussed, including critical control points and internal quality control (IQC) procedures. NMIA participates in over 25 Australian and international proficiency studies annually and analyses certified reference materials (CRMs)I and laboratory spikes into fresh and processed food matrices.

Comparison Urinary Iodine Analysis between Spectrophotometric Detection and Inductively Coupled Plasma Mass Spectrometry

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Spectrophotometric detection of the Sandell-Kolthoff reaction on a microplate reader and alkali extraction before measured by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) methodology for urinary iodine determination was compared. This study aimed to compare an inexpensive and rapid method to determine urinary iodine with an accurate and high cost of ICP-MS analytical technique. For spectrophotometry, urine samples were digested with ammonium persulfate and then analyzed iodine by Sandell-Kolthoff reaction on microplate reader spectrophotometry at 405 nm. For ICP-MS, urine samples were extracted with tetramethylammonium hydroxide (TMAH) solution and assayed ICP-MS. The geometric mean of urinary iodine determined (n 105) by the Sandell-Kolthoff reaction method was 135.2 µg/l (10.2–434.2) whereas by the ICP-MS method, it was 164.4 µg/l (14.1–482.1). The coefficient of determination of this method (R2 0.966) showed a good correlation (0.983), indicating a very high degree of agreement between the two methods. The linear equation gave y = 0.8126x + 1.6627 (y: Sandell-Kolthoff method, x: ICP-MS). The results showed no significant difference (p 0.083) between the two methods tested by the Two-Sample Assuming Unequal Variances. The Sandell-Kolthoff method using microtiter plate technique presented accuracy by spiking 40, 60, and 100 µg/l iodine (%recovery 96.5+11.1%, 105.2+5.6%, and 96.7+5.4%, respectively) which they stayed within AOAC acceptable range (80-110%). The good repeatability of this method (RSDr 5.4-10.3%) passed the acceptable AOAC criteria (RSDr 11%). Participating in interlaboratory comparison with the CDC EQUIP ROUND 66 programs also showed good results by passing the evaluation for all 4 concentration levels (60-350 µg/l). It was concluded that the Sandell-Kolthoff reaction on a microplate reader is suitable for iodine analysis in urine due to its simple, inexpensive, semiautomated method, and comparable to the ICP-MS method.

Keywords: Urine iodine, Microplate Reader, Sandell-Kolthoff Reaction, ICP-MS

Comparison of Iodine Determination in Foods by ICP-MS and Isotope Dilution MS

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Determining iodine in different food matrices provides a considerable challenge in micronutrient analysis due to the low concentrations in most food products. This study aims to develop and validate the iodine determination in foods by alkaline extraction and analyzed with Inductively Coupled Plasma Mass Spectrometry (ICP-MS) as well as compare the routine technique (External calibration curve, CAL) against the Isotope dilution mass spectrometry (IDMS). Standard reference material and food samples in different food matrices were analyzed for iodine content. Iodine in the studies sample was extracted by an alkaline extraction using 1% (TMAH) in an oven at 90 °C for 3 hours and determined by ICP-MS using CAL and IDMS. Moreover, the iodine results were compared with the reference value determined using the IDMS by ETH's reference laboratory. There was no significant difference between iodine content determined by the CAL and IDMS ($p = 0.850$). The coefficient of determination (R2) between CAL and IDMS is 0.9998, indicating a strong correlation between both techniques. Iodine content in the studied sample ranged from less than 0.03 to 52 mg/kg. In addition, the test results by CAL and IDMS differed from reference values ranging from 4-17% and 0.2-9%, respectively. Dried seaweed and seasoned seaweed snacks formed gel during alkaline extraction by using the routine ratio of sample and 1% TMAH (0.5:50). Iodine content in those samples determined by CAL showed 17% and 15% difference from the reference value measured by ETH's laboratory (53 ppm and 33 ppm), respectively. In conclusion, CAL with an optimized ratio of sample and 1% TMAH during alkaline extraction provides high accuracy, good precision, excellent selectivity, and sensitivity (low LOD). This CAL method is suitable for iodine determination in various foods.

Keywords: Isotope dilution, Calibration curve, Food matrix, Iodine analysis

Optimization of APHA method for the determination of ammoniacal nitrogen in water by a discrete analyzer

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Ammoniacal nitrogen (NH3-N) quantifies the presence of nitrogenous organic matter in the form of ammonia, a hazardous pollutant prevalent in aquatic environments. Sources of ammonia emission include agricultural activities, industrial processes, vehicular emissions and volatilization from soils and oceans, posing toxicity risks to human health. Chemical analysis plays a pivotal role in identifying and characterising such toxic substances. The selection of analytical techniques for ammonia determination depends on pollutant concentration and the presence of potential interfering substances. The Discrete Analyzer is one of the spectroscopy techniques used for rapid ammonia quantification without extensive sample preparation. In this study, the method to measure NH3-N in various types of water, including drinking, mineral, raw and tap water was optimised using the Discrete Analyzer. Calibration was carried out according to the APHA 4500-NH3 method with test concentrations ranging from 0.2 mg/L to 2.0 mg/L. This method enabled the detection of NH3-N at five different concentration levels across ten fortified samples, resulting in a coefficient of determination ≥0.990 and recovery ranging from 88% to 110%. In conclusion, this cost-effective and accurate method for rapid ammonia analysis is a significant tool for environmental monitoring and water quality assessment.

Keywords: Ammonia, toxic substances, Discrete Analyzer, water

The validated method and uncertainty measurement of four cannabinoids in beverages

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In present, the Thai government has unlocked the benefits of hemp and marijuana for medical and economic uses, which are allowed by using within the legal framework. The Ministry of Public Health has issued an announcement on specifying the names of narcotics in category 5 (No. 2) on December 15, 2020, excluding some parts of marijuana and hemp from being classified as narcotics. Therefore, food and drink products containing hemp and cannabis are becoming more and more common in Thailand. However, the Thai government has reconsidered to limit the application of hemp and marijuana again. The monitoring of tetrahydrocannabinol (THC) and cannabidiol (CBD) plays an important role in quality control of hemp and cannabis-based products. In this research, the sample preparation was evaluated by using liquid chromatography – tandem mass spectrometry for cannabinoid measurement in beverages. The suitable test method was validated by performing in-house method based on AOAC (2020) 2018.11. The accuracies and precision were in acceptable range as following the EU Commission 2002/657/EC. The validation method was performed for 4 cannabinoids: cannabidiol (CBD), (-)-Δ9-tetrahydrocannabinol (Δ9-THC), (-)-Δ8-tetrahydrocannabinol (Δ8-THC) and (-)-trans-delta-9-THC carboxylic acid A (THCA-A). These results obtained at above 85% for recoveries with all three-concentration levels of 0.10, 50 and 100 mg kg-1. The relative standard deviations (RSDs) were also in the acceptable range with lower 10%. Moreover, the limit of detection and limit of quantitation were 0.010 and 0.10 mg kg-1 at the same levels for all analytes. The measurement uncertainty was in the target with approximately 12%. From the experiments, the method was reliable and suitable for the determination of cannabinoids in the beverages. In real samples application, the cannabinoid concentrations ranged from not detected to 4.10 mg kg-1.

Keywords: Cannabidiol; Tetrahydrocannabinol; CBD; THC; Beverages

Determination of Total Sugars by Ultra High-Performance Liquid Chromatography - Evaporative Light Scattering Detector

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The determination of sugar content using chromatographic techniques is one of the important methods among laboratories and also the sugar processing industry. The introduction of excise duty on ready-to-drink sugary drink products by the government in the last Budget 2019, prompted the analysis of the sugar content to be carried out seriously. KIMIA Malaysia plays an important role by providing this analysis service to government agencies involved in helping the duty collection process. The main purpose of introducing this duty is due to the government's concern with the current statistical problem of chronic diseases caused by high sugar intake among Malaysians. The types of sugar that are given attention are glucose, sucrose, maltose, lactose and fructose. If the total sugar content exceeds the set threshold value, it will cause the beverage product to be subject to this excise duty. Among the categories of ready-to-drink sugary drinks that are listed are drinks in cans, bottles, boxes that contain more than 5g/100ml of sugar, flavored milk drinks that contain more than 7g/100ml of sugar and fruit and vegetable juice drinks that contain more than 12g/100ml of sugar. Analysis of the determination of sugar content using HP-LC with an ELSD detector.

Keywords: HP-LC ELSD, sugar content, Ready-to-drink sugary

Calorimetric evaluation and characterization of food grains, fruits, vegetables, fish, meat, and dairy products

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Calorimetric evaluation methods and devices were readily available for food processors, quality standard agency and research laboratories. Caloric energy contents of snack foods are required on product labels and as well for food outlet menus. This study was conducted to measure, characterize, and evaluate caloric heat energy in a range of food categories. Foods were selected for grain, bean, vegetable, fruit, oil seeds, daily product, fish, and meat category. Caloric analytical samples were obtained from various sources including supermarkets, food produce outlets, fresh fruit and vegetable market and seeds company. Fresh, wet, and liquid specimens were freeze dried using Labconco FreezeDry (-84C and 0.01 mBar vacuum pressure for 48 – 60 hrs) to constant dryness. The thermal energy contents of foods were determined using calorimeter (Parr 650) and presented calorimetric unit of Kilocalorie (Kcal/g) in dry matter (100°C) bases. Foods and feed specimen were sampled from bulk products or packs, subsampled for calorimetric analytical preparation. All samples were freeze dried and milled to pass standard sieve size (1 mm) prior to combust in Bomb calorimeter (Parr, USA). Dry matter weights were corrected by specimen dry weight at 100°C oven dry rate at tests. The duplicated combust test was conducted for each specimen while recorded energy values differ more than 0.2% a repeat was conducted. Data were analyzed and compared among categories with t-test statistics of SAS. The results indicated that meats and processed products have the highest thermal energy, followed by beans, grains, vegetable and forage feeds of the dry matter. Samples of processed products examined were close to the label information with variation in products and processors. This analysis suggests that the thermal energy measurements and evaluation may help to improve quality control, dietary plan, and product formulation.

Keywords: Food grain, meat, feed, byproduct, thermal calorie energy

Nitrite content of locally-produced branded processed meat in the Philippines

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Nitrite is an essential food preservative that inhibits the growth of harmful microorganisms and is one of the parameters monitored in processed meat products. At excessive levels, however, it may cause significant health problems. An analytical method capable of providing reliable, accurate, and metrologically traceable test results must be in place to ensure compliance with the maximum permissible level (MAL) of nitrite in processed meat set by the Codex General Standard for Food Additives (2021).

In this study, the AOAC Method 973.31 was verified for its suitability to determine the amount of nitrite in different processed meat by UV-Vis Spectrophotometer. Subsequently, it was used to analyze nitrite in locally-produced branded processed meat in the Philippines. Market processed meat samples tested include ham, sausage, burger patty, chorizo (pork and chicken), luncheon meat, corned beef, tocino, and bacon.

The linear working range nitrite in meat is at 0.02 - 1.00 mg/L NO_2.Method detection limit (MDL) and method quantification limit (MQL) are 1.0 mg/kg and 3.3 mg/kg, respectively. Trueness was evaluated by spiking, and recoveries ranged from 80.5 to 103.4 %, which are within the recovery limits set by AOAC (i.e., 80-110%) for this analyte level of concentration. The precision test resulted in a good repeatability of 0.30 to 7.15 % RSD, which is within the AOAC precision limit of 7.3 (calculated RSDr). For the analysis of market samples, all of the locally-produced processed meat with nitrite indicated in the label contain nitrite but at concentrations less than the MAL of 80 mg/kg for processed comminuted and heat-treated processed meat. Meanwhile, nitrite was not detected in processed meat samples that did not indicate it as an ingredient. This implies that the products tested conformed to regulations and complied with proper labeling of processed food products.

Keywords: food preservatives, food safety, nitrite, processed meat, UV-Vis Spectrophotometer

Foreign matter in food identification: A review in Department of Chemistry Malaysia

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Contamination of foreign matter is one of the biggest concerns in the food processing industry worldwide. A foreign matter is defined as non-food materials or foreign bodies that are not typically part of the food product that are likely to increase the risk of developing illness and potential hazards to human health. Contamination of foreign materials possibly occurs at the food processing plants including parts of raw materials, physical materials such as metal, glass, and wood, or biological materials such as insects, parasites, hair, fingernails, rodent pellet, or any materials from other biological sources that are not part of food products. Department of Chemistry Malaysia (KIMIA Malaysia) provides scientific analysis of foreign matter in food for the enforcement and monitoring purposes under the Food Act 1983 & Food Regulations 1985. The department receives various types of food samples such as raw perishables, processed, and packaged food. Thus, supportive methodology has been developed and established to identify these biological contaminants in the laboratory. The biological contaminants found in samples will be preserved in 70% alcohol and identified using morphological examination under a stereo or compound microscope with reference to taxonomic key. These approaches have successfully demonstrated the identification of many biological contaminants such as *Hemidactylus frenatus*, *Sitophilus oryzae, Carpophilus hemipterus, Musca domestica*, and *Anisakis sp*. in food samples which helps in reducing potential food safety hazards and risk in Malaysia.

Keywords: Foreign matter, biological contaminant, physical analysis

Trace element analysis of spices and herbs using ICP-MS after microwave digestion

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Spices and herbs are increasingly in demand worldwide because of their historic importance in food preservatives and ingredients, and may have health benefits. There is also a concern that spices and herbs can contain chemical contaminants such as heavy metals. The aims of the study were to assess and monitor the distribution levels of trace elements in spices and herbs, and to compare for any elevated levels from different countries that could cause health concern from dietary exposure of toxic metals. The imported dried spices and herbs (n=69) from different countries were purchased from selected Queensland markets. The dried samples of organically produced turmeric (n=7) and conventional (non-organic) turmeric products (n=13) were obtained from local markets. The levels of trace elements were analysed by ICP-MS after microwave digestion, and appropriate standard reference materials were used for quality control and method validation. The study found wide variation of trace element levels in herbs and spices. The results showed considerably high levels of aluminium were found in cinnamon (11-920 mg/kg) and turmeric (78-1400 mg/kg). Relatively high levels of strontium (260-290 mg/kg) in basil, and low in turmeric (7.3-28 mg/kg). The levels of mercury (<0.005-0.059 mg/kg) in these spice products were very low and most were below the reporting limit of the method. Relatively low levels were found for arsenic (0.007-1.7 mg/kg), cadmium (0.008-3.7), chromium (<0.01-5.8 mg/kg), nickel (0.28-4.8 mg/kg) and lead (<0.005-7.0 mg/kg). Based on published estimated intakes of spices at 0.12-6 g/day, the contribution of spices to dietary metal exposure was found considerably low. The trace element levels in spices and herbs in this study showed wide variations, but comparable to the reported levels in other countries. It can be concluded that the contribution of spices to toxic heavy metal (arsenic, cadmium, mercury, lead) dietary exposure would be considered low.

Keywords: spices, herbs, heavy metals, trace elements

Investigation of honey adulteration using nuclear measurement techniques

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Honey is one of the agricultural products that Thailand is the second largest producer of honey in Southeast Asia. Thailand has laws related to honey quality control (the Agricultural Standards for Honey, TAS 8003-2013), however, the content of this law still has gaps that could allow bottled honey manufacturers to add some sugar to increase the volume of their products. This study aimed to study the changes in stable isotope values in honey after adulteration with various sugars and use this knowledge as a database to help distinguish counterfeit honey from natural honey. Honey samples were collected from honey producers in Chiang Mai and analysed by an Elemental Analyser Coupled to Isotope Ratio Mass Spectrometry (EA-IRMS) and Cavity Ring-down Spectrometry (CRDS). Data on various types of sugar values (total sugar, sucrose, glucose, fructose, and maltose) were taken into consideration together with the stable isotope ratio of carbon (δ13C) of honey and honey protein along with data analysis using Principal Components Analysis (PCA). Adulteration detection is still limited if the adulteration concentration is lower than 5%, except for the samples mixed with high fructose syrup (HFS,55%). This is due to 55% HFS have various sugar values and δ13C values in the same range as all real honey bees. As for maltose syrup, glucose syrup, corn syrup, and rice syrup, they contain high maltose content (>50% by weight), the addition of these syrups to honey is likely to be no more than 5% because it will cause the maltose value to exceed the normal values (3- 4 g/100 g). The nuclear measurement techniques use δ13C values between honey and its protein δ13C honey-protein as a criterion to identify as adulterated honey with exogenous sugars. However, other variables or techniques should be taken into consideration in further studies to make the identification of adulteration more accurate and low syrup adulterations.

Keywords: Honey, Sugar, Adulteration, Carbon-13 Isotope, EA-IRMS, CRDS

Nutrient-related non-communicable diseases (fat, sugar, sodium) of school-age children's popular foods in Thailand

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In the past 40 years about 5-17% of the school-age group (20-25% in private school) was over nutrition and obesity. In 2023, the Department of Health, Ministry of Public Health reported percent of obesity in this age group is still high at 13.4%. Consumption of high-fat foods could be the causing risk of health problems for school-age children. In this study, based on the survey data on Thai food consumption in 2016, the most popular ready-to-eat recipes and food ingredients for school-age children were selected. Each kind of the selected food was bought from 3-5 food shops located in the central area of Suphan Buri, Ubon Ratchathani, Lampang, Nakhon Si Thammarat, and Bangkok provinces. For each province, the selected food shops are located at schools, or the local popular food shops and shops are located at the market. Then each of the selected foods was prepared into multiple composite samples (n=5) and analyzed at the ISO 17025 accredited INMU laboratory. Nineteen types of the selected foods were analyzed for macronutrients, sugar, sodium, cholesterol, and fatty acid profiles. The results showed that the selected foods contained total sugar 0-13%, fat 5-37%, sodium 267-883 mg/100g of fresh weight (FW), and cholesterol 117-286 mg/100g FW. The fatty acids composition was found in the form of saturated fatty acids (2-15%), monounsaturated fatty acids (1-16%), polyunsaturated fatty acids (1-5%), and trans fatty acids (less than 0.5%). The mean values of these nutrients of selected foods were presented in the online Thai Food Composition Database of the Institute of Nutrition (https://inmu.mahidol.ac.th/thaifcd/home.php), which this website allows the public to access the online database free of charge. In addition, the database could be used for the selection of suitable food for all people especially school-age students and those who are concerned with nutrient-related non-communicable diseases (fat, sugar, sodium).

Keywords: School-age children's popular foods, Total sugar, Fat, Sodium, Cholesterol

Street Foods in Malaysia: What are the individual and total sugar contents?

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In developing countries, street foods pose a high contribution to daily sugar intake, in which excessive sugar consumption is associated with obesity, a risk factor for various types of non-communicable diseases. In Malaysia, about 70% of the population consumes out-of-home foods regularly, including street foods as this food source is convenient, accessible, and affordable. Nutrition labelling is not required for street stall type of food premises in Malaysia which makes it difficult for consumers to distinguish low and high-sugar foods. Thus, it is necessary to ascertain how much sugar is present in these foods. Local studies on the nutrient content including sugar in out-of-home foods are also limited. Thus, the current study aims to determine the individual and total sugar contents in 210 different types of street food commonly available in Malaysia. A total of 10,520 street foods were surveyed across all states in Malaysia and categorised into desserts(D), snacks(S) and main meals (MM). Food sampling and analysis on 210 selected street foods were then conducted using HPLC with an RI detector to determine individual sugar content (fructose, glucose, sucrose, maltose, and lactose). The recovery values of total sugar, fructose, glucose, sucrose, and maltose for street foods were 95.6-97.3%, 94.3-100.2%, 95.6-97.9%, 93.6-96.1%, and 97.3-98%, respectively. D contained the highest total sugar, sucrose, fructose, glucose, and maltose compared to S and MM. Sucrose was predominant in 90% of D, 79.3% of S, and 68.6% of MM. Most D (93.3%) contained medium (5-15g/100g) to high sugar content (>15 g/100 g). About 82.9% of MM and 65.5% of S contained low sugar content (<5g/100g). These findings could help consumers identify between foods high and low in sugar. Furthermore, the data could be used as a base study for policymakers to review potential health benefits, especially in the fight against obesity.

Keywords: Main meals, desserts, snacks, sucrose, street food

In-syringe dispersive micro solid phase extraction method for the HPLC-fluorescence determination of aflatoxins in rice

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The simultaneous determination of aflatoxins (B1, B2, G1 and G2) in rice using in-syringe dispersive micro-solid phase extraction (ISDμSPE), coupled with high performance liquid chromatography with fluorescence detection is described. The samples (25g) were extracted after mixed with 125 ml methanol:water (96;4, v/v) and 5 g of sodium chloride. Then the extracts were filtered with Whatman filter paper (No. 4). The filtrate (20 ml) were diluted to 50 ml with water. The diluted filtrate (2.5 ml) was mixed with dispersive sorbent in a syringe that was attached with glass fiber syringe filter (25 mm I.D and 0.7 μm pore size). Samples were vortexed and passed through the glass fiber syringe filter followed by washing, elution and evaporation processes. Then, the residue was reconstituted in 200 μL of organic solvent and water for HPLC determination. The separation of aflatoxins was performed using C18 Hypersil gold (250 mm x 4.6 mm, 5 μm) column at 40°C. The excitation and emission wavelength of the fluorescence detector was at 360 nm and 440 nm, respectively. On-line photo-chemical derivatisation was used to enhance the detection of aflatoxin B1 and G1. Limits of quantification (LOQ) ranged from 0.30 to 0.96 μg kg-1, recoveries from 76.2 to 99.9 % and relative standard deviations (RSD) from 0.3 to 7.0%.

Keywords: Aflatoxins, syringe, HPLC

Benzoic acid and carcinogenic benzene levels in functional drinks collected in Thailand

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Benzene exposure leads to an increased risk of cancer. Benzene formation in non-alcoholic beverages is one of the concern topics for consumers because benzene can be formed in drinks containing benzoic acid, a commonly used preservative, and vitamin C. This study aimed to determine benzoic acid and benzene contents in functional beverages and conduct exposure assessment of benzoic acid and benzene from functional beverage consumption in Thai population. A total of 47 functional drinks containing benzoic acid were purchased from convenience stores in Bangkok. The beverage samples were classified into four groups namely energy drink, sports drink, enriched drink, and nutraceutical drink according to the available consumption data from the national survey. Benzoic acid and benzene contents in the beverage samples were determined by high-performance liquid chromatography (HPLC) and gas chromatography–mass spectrometry (GC–MS), respectively. The results showed that benzoic acid levels in the functional drink samples, were ranged between 74–229 mg/L. Benzene concentrations varied from 0.60 to 551 µg/L. The results showed that 30% of samples contained benzene levels above the World Health Organisation (WHO) limit of benzene in drinking water (10 µg/L). Frequent consumption of drinks enriched with vitamin C that contain benzoic acid leads to significant exposure to benzene, which poses potential carcinogenic risk. Risk communication about potential benzene formation in foods and beverages using benzoic acid in combination with vitamin C should be provided to all stakeholders for effective risk management.

Keywords: benzene, benzoic acid, process-induced food toxicant, risk assessment

Multi-pesticide residue analysis for fresh product by high-resolution mass spectrometry

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More than 8000 pesticide products are formally registered for use in Australia. This presentation briefs the successful application of sensitive and robust multi-residue pesticide methods capable of analysing over 500 pesticide analytes in Australian fresh produce and agriculture commodities. The analytical method adopted the traditional QuEChERs method approach, with modification to fit a wide range of herbicides. The use of orbit trap high resolution mass spectrometry technology makes the method efficient and robust enough to cope with a wide range of matrices. Detailed statistics were illustrated in the article that over 40,000 samples were tested, containing more than 250 individual sample types categorized in 23 food classifications. In the recent years, more than 120 pesticides and associate metabolites were detected. Pesticide groups and individual analytes that were frequently detected in certain commodity groups were discussed. It is important for on-going pesticide residue testing programs to be in place at state and national levels to ensure the food safety objective of Australian consumers, and that good agricultural practices are followed.

Keywords: QuEChERs, Orbit trap, Residue

Unveiling honey authenticity: Analysis of C-4 plant sugar adulteration using EA-IRMS.

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The carbon isotope ratio (δ13C = 13C/12C, ‰) profiles of 50 distinct honey samples were acquired utilizing an isotope ratio mass spectrometer coupled with an elemental analyzer (EA-IRMS) to ascertain adulteration. Detection of adulterants relied on contrasting the δ13C values of honey with those of its protein, utilized as an internal standard. Methodology adhered to the specifications outlined in Official Methods of Analysis 998.12 (AOAC, 2005) with minor adjustments. δ13C values for honey protein ranged from -20.14‰ to -32.08‰, while those for honey itself varied from -10.3‰ to -30.63‰. A total of 24 honey samples, constituting 48% of the dataset, were identified as adulterated. Validation of the method encompassed assessments of accuracy, linearity, selectivity, and precision.

Keywords: Honey adulteration; Carbon Isotope Ratio (13C/12C); EA-IRMS; C4- plant sugar

Folate content in fresh strawberries and the colour changes during refrigerated storage

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Strawberry (Fragaria × annanasa) is a rich source of folate, also known as vitamin B9. The objective of this study was to investigate the active and storage forms of folate in strawberries and to monitor the colour changes of strawberries during refrigerated storage at 4°C. An active form of folate: tetrahydrofolate (THF) and three storage forms of folate: 5-methyl-THF, 5-formyl-THF and 10-formyl-FA were detected using High Performance Liquid Chromatography (HPLC) in the fresh strawberries. However, 5,10-methylene-THF, an active form of folate could not be detected in the fresh strawberries. The dominant form of folate in the strawberries was 5-methyl-THF (87.5%), followed by 10-formyl-FA (8.1%), THF (3%) and 5-formyl-THF (2%). The total folate content of strawberries determined by HPLC analysis and microbiological assay was 31.3 ± 5.6 µg/100 g of fruits and 27.1 ± 1.2 µg/100 g of fruits, respectively. Nonetheless, no significant difference was observed in the total folate content determined by both methods. The colour changes of the external skin of strawberries during refrigerated storage at 4°C were determined using a Hunter colourimeter daily for 6 days. For colour measurement, there was only slight fluctuation in L*, a* and b* values observed on the first three days of refrigerated storage. Nonetheless, on the fourth day, significant reduction in L*, a* and b* values occurred. For total colour difference, the strawberries stored at 4°C showed a very distinct difference (ΔE between 4.6 ± 4.1 and 27.8 ± 2.3) to the fresh strawberries. This study demonstrated that chemical and microbiological analysis could be used to determine the total folate content of fresh strawberries whereas a colourimeter provided an objective measurement of colour changes in strawberries.

Keywords: Folate, folic acid, HPLC, strawberry, vitamin B9

Study of heavy metal contents in Lung oyster mushrooms, Bhutan oyster mushrooms and their planting materials.

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The presence of heavy metals in mushrooms has drawn considerable attention due to its potential implications for consumer health. Heavy metals, naturally occurring elements, can accumulate and be found in water and planting materials. Mushrooms, recognized as bioaccumulators, possess a remarkable ability to absorb and concentrate heavy metals from their surrounding environment. This study aims to investigate the levels of arsenic, cadmium, lead, and mercury in Lung oyster mushrooms and Bhutan oyster mushrooms as well as their planting materials. The heavy metals were measured by Inductively Coupled Plasma Mass Spectrometry (ICP-triple quadrupole MS) using the AOAC Official Method 2015.01 (AOAC, 2023). All studied heavy metals found low-level amounts compared to the maximum limit according to the Notification of Ministry of Public Health (No 414, 2020) issued by the Food Act B.E. 2522 Re: Standards for Contaminants in Food. After assessing the risk of exposure to heavy metals from food intake, most of the population was found to be safe from arsenic, mercury, cadmium, and lead. Exception for those who consumed high levels (at 97.5 percentile of the group eater only) showed a higher risk of adverse effects from exposure to arsenic and lead in some age groups in both oyster mushrooms. The cultivation matrix used for growing these mushrooms was also analyzed for heavy metal contents. Most of the heavy metals in mushrooms come from the cultivation matrix, especially rubber wood sawdust, rice bran, and lime. Arsenic was better absorbed than lead in both Lung oyster mushrooms (9.7% As uptake and 1.7% Pb uptake) and Bhutan oyster mushrooms (6.6% As uptake and 0.6% Pb uptake). Lung oyster mushrooms absorbed arsenic and lead better than Bhutan oyster mushrooms. This study proves that the studied mushrooms had a low risk of concern of heavy metals except those highly consumed.

Keywords: Heavy metals, Oyster mushrooms, Risk assessment, Planting materials

Establishment of Thai FCD for developing Asian Food Composition Database

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With financial support from the Asian Food and Agriculture Cooperation Initiative (AFACI) in Korea, from July 2021 to June 2024, the activities on systematic development of the Thai Food Composition Database (Thai-FCD) were conducted. The main objective of the three-year activities was to generate the Thai Food Composition Database (Thai-FCD) of 100 foods and use them for establishing the Asian Food Composition Database (AFCD). The selected foods were varieties of plant foods from five food groups and varieties of animal foods from two food groups. The number of samples in each group is 21 in cereal, 3 in starchy roots and tubers, 9 in legumes, nuts, and seeds, 17 in vegetables, 34 in fruit, 14 in Finfish, shellfish, and other aquatic animals, and 2 in egg groups. Three individuals of each food were sampled from three independent locations and prepared for individual nutrient analysis. The analyzed nutrients in the selected foods are proximate composition, minerals, and some vitamins and total sugar (only in fruits) using an accredited INMU laboratory based on ISO/IEC 17025:2017. High-quality Thai FCD and AFCD which contain 100 different varieties of the selected foods. The databases of energy and 6 main nutrients, 8 minerals, and 6-10 vitamins in selected 100 food items were obtained. Archival, reference, and user databases were developed. Reference and user databases were incorporated into the Thai FCD and the Asian FCD formats. The completed report which includes the developed Thai FCD of the 100 foods, presented in the AFCD format, was submitted to AFACI as the outcome of the three-year activities. The Thai FCD 2015 with the 100 newly developed FCD of Thai foods from this project were updated in the online Thai FCD which databases have been used at the national, regional or international levels.

Keywords: Food Composition Database, Systematic development, Food, AFACI

Determination of fatty acid composition in food products using Gas Chromatography Flame Ionization Detector (GC-FID) based on chemometric approach.

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Ensuring the authenticity of food products is crucial for the food industry to comply with legal regulations, maintain economic integrity, ensure consistent quality, use safe ingredients, and adhere to religious dietary restrictions. The adulteration and mislabelling of animal fat sources in food products, such as pork lard, buffalo tallow, and cow tallow, pose significant concerns, particularly for followers of specific religious practices, such as Muslims and Hindus. There has been considerable interest among researchers in developing analytical methods to address this issue. The aim of this study was to identify animal fat sources in food samples using gas chromatography with flame ionization detection (GC-FID) coupled with chemometric techniques. Samples of raw meat, burger patties, and meatballs made from pigs, buffaloes, and cows were purchased from local supermarkets and extracted via esterification of fatty acids to fatty acid methyl esters using a base catalyst and analysed by GC-FID. A minimum of 30 sets of fatty acid methyl esters (FAME) data were collected from each sample. The FAME data was processed using XLSTAT 2023 software version 25.3.0 which includes the following steps: dataset pre-processing, principal component analysis (PCA), discriminant analysis (DA), and partial least square regression (PLSR) analysis. The pre-processed was performed using Keiser-Meyer Olkin (KMO), test at a significance level (α) of 0.05. A KMO index above 0.5 was considered adequate for further chemometric analysis. The PCA identified 10 most significant FAMEs including caproic (C6:0), myristic (C14:0), palmitic (C16:0), palmitoleic (C16:1), stearic (C18:0), oleic (C18:1n9c), linoleic (C18:2n6c), cis-eicosenoic (C20:1), linolenic (C18:3n3) and docosahexaenoic (C22:6n3) acids to discriminate the animal fat sources. Further, DA successfully classified the animal sources in food samples using the 10 significant fatty acids for authentication purposes. Therefore, the incorporation of multivariate and instrumental analyses could effectively use to resolve authentication issues involving animal fat ingredient in food samples.

Keywords: Gas chromatography with flame ionization detection (GC-FID), Fatty acid, Chemometric, Principal component analysis (PCA), Discriminant analysis (DA)

Marine ecological research conducted surrounding Nenasi Beach area, Pekan Pahang using Isotope Ratio Mass Spectrometer (IRMS)

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The objective of this study was to develop a method to determine the correlations of marine samples collected from the Nenasi Beach, Pekan Pahang. Currently, marine ecosystem research is focused on investigating the feeding dynamics and utilization patterns of charismatic and endangered marine species such as Irrawaddy dolphins, sea turtles, groupers, and reef sharks within marine ecosystems. These investigations utilize Stable Isotope Analysis (SIA) as a sophisticated ecological tool. This paper presents an analysis of several samples based on Isotope Ratio Mass Spectrometry (IRMS) data. Carbon and Nitrogen stable isotope ratios were determined and evaluated as variables for the differentiation process. Statistical techniques including boxplot, outlier test and principal components analysis (PCA) were employed. The analysis was conducted on 56 marine samples obtained from University Malaysia Terengganu (UMT) then combining three chemometric techniques based on different principles and determination criteria. Principal analysis yielded 54.24%, 27.53%, 16.68% and 1.55% of the variance for each component. These results highlight the effectiveness of utilizing IRMS stable isotope ratios along with various chemometric techniques for determining the correlations of marine ecosystem samples.

Keywords: Marine ecosystem; IRMS; $\delta^{13}C$; $\delta^{15}N$; Chemometric data analysis

Determination of 3-monochloro-propanediol and glycidyl ester according to ISO 18363-1:2015

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During the high temperature processing involved in refining vegetable oils, 3-monochloro-propanediol (3-MCPD) and glycidyl ester (GE) are formed. The International Agency for Research on Cancer (IARC) has classified 3-MCPD as Group 2B (Possibly Carcinogenic to Humans) and GE as Group 2A (Probably Carcinogenic to Humans). The presence of 3-MCPD and GE in vegetable oil is particularly concerning due to the widespread use of vegetable oil in food and other industries. An analytical method for detecting 3-MCPD and GE in vegetable oil was developed and validated according to ISO 18363-1:2015, demonstrating good performance on all parameters. A total of 15 samples of vegetable oil were analyzed using gas chromatography with mass spectrometry (GC-MS). The highest levels of 3-MCPD and GE were found, respectively, in Refined, Bleached, and Deodorized Palm Oil (RBDPO) at 2561.39 µg/kg and 4290.76 µg/kg, Refined, Bleached Coconut Oil (RBCNO) at 1210.32 µg/kg and 1464.57 µg/kg. None of 3-MCPD and GE were found in Crude Palm Oil (CPO). 3-MCPD and GE were found, respectively, in 6.67% and 13.33% of the vegetable oil samples, exceeded the maximum limits (1250 µg/kg for 3-MCPD and 1000 µg/kg for GE) established by Commission Regulation (EU) No. 2023/915.

Keywords: 3-MCPD, GE, Vegetable oil, GC-MS

Comparative study of the HPLC-RID and conventional titration methods for sugar analysis in food products

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Sugar is a common ingredient in the food industry, crucial for flavor, texture, and preservation. However, excessive sugar intake is linked to various health problems, including obesity, diabetes, and cardiovascular diseases. Therefore, it is essential to accurately and precisely determine sugar levels in food products for accurate nutritional labeling and regulatory compliance. The growing consumer demand for transparent food labeling has increased the need for reliable analytical techniques in sugar analysis. Since January 2024, new regulations enforced under the Food Regulations 1985 mandate the labeling of sugar content in food products. This legislative change has led to the need for robust analytical methods capable of producing precise and comprehensive sugar profiles. This study compared the effectiveness, precision, and reliability of two approaches to sugar detection in food products: the conventional Lane-Eynon method and High-Performance Liquid Chromatography with Refractive Index Detection (HPLC-RID). The HPLC-RID method quantified glucose, fructose, sucrose, and maltose, while the Lane-Eynon method involved titrating inverted sugar solutions against mixed Fehling's solution to determine total sugar content. Each approach is evaluated based on operational efficiency, detection limits, accuracy, and precision. Preliminary data indicate that HPLC-RID offers superior precision and accuracy in quantifying specific sugars compared to the titration method. HPLC-RID can identify specific sugar profiles with greater specificity and lower detection limits. Conversely, the titration approach, while easier to use and more affordable, exhibits greater variability and lower sensitivity, particularly in complex food matrices. This study highlights the importance of selecting the appropriate analytical technique for sugar analysis in food products. HPLC-RID proved to be a more accurate and reliable procedure compared to the traditional titration method, especially for regulatory compliance and comprehensive nutritional labeling. Future investigations will focus on refining HPLC-RID procedures and enhancing the accuracy and reliability of sugar analysis across various food matrices.

Keywords: Sugar, HPLC, RID, Lane-Eynon, titration, food

Rapid Detection of Escherichia coli O157:H7 in Food by Real-Time PCR Assay

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Escherichia coli O157:H7 (*E. coli* O157:H7) is an important pathogen causing food poisoning outbreaks in humans. This pathogen produces Shiga-like toxin which can be responsible for gastrointestinal diseases such as diarrhoea and haemorrhagic colitis. Therefore, developing a method for detection of *E. coli* O157:H7 in food is a major challenge for food safety. Moreover, traditional methods are time-consuming and laborious processes. The aim of our study was to develop a rapid and sensitive assay to detect *E. coli* O157:H7 in food using iQ-Check *E. coli* O157:H7 (BIO-RAD, US) real-time PCR (qPCR). This study evaluated the selectivity using two strains of *E. coli* (E. coli O157:H7 ATCC 43888 and *E. coli* ATCC 25922 and eight non-*E. coli* strains. The qPCR results showed that only *E. coli* O157:H7 was tested positive and all other bacteria strains were negative, indicating that this method is selective for *E. coli* O157:H7. The specificity test carried out against ten bacteria also showed that only *E. coli* O157:H7 was detected proving this method is highly specific for *E. coli* O157:H7. In addition, a serial dilution of *E. coli* O157:H7 was conducted using eleven different concentrations of DNA. The qPCR results showed that this method was able to detect as low as 0.001 ng/ul of *E. coli* O157:H7 proving that this method is also very sensitive in detecting the low presence of *E. coli* O157:H7 in food. Furthermore, the quantification of cycle (Cq) value of the qPCR assay was between 22.65 to 25.40, corresponding to 50ng DNA of E. coli O157:H7. Any Cq value above 35 cycles was reported to be negative. This assay was also proven to be reproducible. Thus, our study concluded that this method is a useful tool for rapid, specific and sensitive detection of *E. coli* O157:H7 in food.

Keyword: *E. coli* O157:H7, Real-Time PCR, Pathogen, Food

Sequenced-based Identification of bacteria using MicroSEQ™ 500 16S rDNA System

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Bacterial diseases have become a serious public health concern globally due to the increasing trend of resistance displayed by bacterial pathogens. Many microbiology laboratories worldwide face challenges in identifying slow-growing, unculturable, and rare bacteria in their routine cases. The conventional methods used to detect these unknown bacteria, such as Gram staining and biochemical tests, are time-consuming, laborious, and may not identify bacteria to the species level. Recent advancements in DNA sequencing have played an important role in identifying bacterial isolates in microbiology laboratories. The present study aimed to isolate and identify unknown bacteria from food and water samples using the MicroSEQ™ 500 16S rDNA system. Bacterial samples were identified by comparing the first 500 base pairs of the 16S rDNA sequences to the MicroSEQ™ database. Evaluation of the MicroSEQ™ 500 microbial identification system was conducted with known bacterial cultures including Escherichia coli, Klebsiella pneumoniae, Enterobacter aerogenes, Listeria monocytogenes, Citrobacter freundii, Bacillus cereus, Bacillus subtilis, Enterococcus faecalis, Bacillus coagulans, and Geobacillus stearothermophilus obtained from American Type Culture Collection (ATCC) strains, which were used as reference bacterial cultures. All isolates were successfully sequenced to the species level and showed similarity between 99.0% to 100.0% to that of the MicroSEQ™ database. A total of ten unknown bacterial isolates from water and food samples were sequenced and the results were concordant with identifications made by biochemical testing using the BIOLOG System and Polymerase Chain Reaction (PCR). These significant bacterial strains that showed ambiguous biochemical profiles representing aerobic gram-positive and gram-negative, and anaerobic bacteria, were successfully identified using this system. The MicroSEQ™ identification system is an accurate and rapid method for identifying unknown bacteria in the laboratory. The turnaround time for this system was shortened to 48 hours, allowing results to be reported much earlier with high accuracy.

Keywords: DNA sequencing, MicroSEQTM database, bacterial isolates, water and food microbiology

Proficiency testing performances for the determination of total arsenic in anchovies

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The proficiency testing (PT) program for more than 20 Malaysian and ASEAN laboratories in determining total arsenic (tAs) in dried anchovies which was carried out in 2019, 2021, 2023 and 2024 is discussed. The program is one of the Department of Chemistry Malaysia (KIMIA) series that acts as a valuable external quality control tool to evaluate and compare the methods and procedures used by participating laboratories in the measurement of inorganic contaminants of different tAs concentrations in anchovies. The participants' results, assigned values based on a consensus approach, standard deviation for proficiency testing assessment based on Thompson-Horwitz functions and experience from previous rounds along with methods employed across the four years of the PT schemes were analysed. The tested tAs over the four years of the PT schemes were determined within a range of 2.6 mg/kg to 6.2 mg/kg. Participant performances were evaluated through z-scores or z'-scores, and demonstrated satisfactory rates of over 84%, particularly above the concentration of 3.7 mg/kg. The primary techniques used included inductively coupled plasma optical emission spectrometry (ICP-OES) and inductively coupled plasma mass spectrometry (ICP-MS). Overall, the PT outcomes showcased satisfactory performances among Malaysian and ASEAN laboratories in assuring compliance with the ISO/IEC 17025 related to the determination of food contaminants at trace levels.

Keywords: Proficiency testing, Total arsenic, Anchovies

Characterisation of Arsenic and Cadmium in brown rice flour as a candidate material for reference material

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Isotope dilution mass spectrometry (IDMS) was used to assign certified values and conduct long-term stability studies for cadmium in the development of the brown rice flour-certified reference material. For total arsenic, the standard addition method was used. The analytes were found to be homogenous and stable over a period of at least 4 months at a storage temperature of −20 °C (long- term stability). The certified mass fraction values were 0.439 mg/kg ± 0.019 mg/kg for cadmium and 0.313 mg/kg ± 0.014 mg/kg for total arsenic. This brown rice flour-certified reference material can be used for method validation or as a quality control material by routine testing laboratories.

Keywords: Brown rice flour, IDMS, Total arsenic, Cadmium

HSA's role in food safety and security – Ensuring global comparability through certified reference materials

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Singapore's heavy reliance on food imports from over 170 countries underscores the critical importance of ensuring food safety and security. The convergence of climate change and geopolitical dynamics further compounds the urgency of addressing the global food security crisis. To bolster food security and resilience, the Singapore government has embarked on the "30 by 30" strategy, aiming to locally and sustainably produce 30% of its nutritional needs by 2030, which includes innovative and sustainable food sources such as the approval of 16 species of insects as food and the
commercial sale of cultivated meat.

The Chemical Metrology Lab (CML), Health Sciences Authority (HSA), in supporting food safety, has consistently established metrological services for food contaminants, additives, nutrients, and other essential components. This presentation will specifically highlight HSA's certified reference materials which are developed based on ISO 17034 requirements. It also highlights HSA's initiative in novel proteins, underscoring our commitment to continuously advance global comparability and enhance food safety standards.

Keywords: metrological services, food safety

Purity determination of caffeine as high-purity organic substance reference material using a mass balance approach

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The study aimed to evaluate the purity of caffeine, the primary stimulant in coffee and tea, as a high-purity organic reference material. The purity assessment was conducted using a mass balance approach in accordance with ISO 17034:2016 and ISO Guide 35:2017 for reference material production. Homogeneity testing, performed via High-Performance Liquid Chromatography (HPLC) and supported by statistical analysis, confirmed substance uniformity. Impurities, including those from structurally related organic compounds, residual organic solvents, and non-volatile residues, were analyzed using HPLC, Karl Fischer Coulometry, and Thermogravimetric Analysis (TGA) respectively. The determined purity was found to be 99.08% ± 0.69%. Stability testing was conducted over four years and confirmed its suitability as reference material for caffeine analysis.

Keywords: caffeine, reference material, mass balance

Development of Fish Meal Quality Control Samples: Homogeneity and Stability Assessment

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Abstract

The Zamboanga Peninsula, a key fishing hub in the Philippines renowned for its sardine fisheries, also boasts a significant fish meal industry. Fish meal, prized for its high protein content and nutritional value, serves as a crucial component in aquafeed and pet food production. Quality control samples play a vital role in monitoring and maintaining the consistency of fish meal batches. However, the homogeneity and stability of these control samples need to be assessed to ensure their reliability in quality control procedures. This study aimed to develop fish meal quality control samples and assess their homogeneity and stability over time. The goal was to provide reliable reference material for quality control purposes in the aquafeed industry in the Zamboanga Peninsula. Fish meal samples were collected from different sources and subjected to thorough analysis to determine their nutritional composition using AOAC standard methods. Subsequently, a homogeneity study was conducted to assess the uniformity of the control samples, and stability testing was involved to monitor the samples under specific storage conditions over a defined period. The developed fish meal quality control samples demonstrated satisfactory homogeneity, with consistent nutritional composition across multiple subsamples. Stability testing revealed that the samples maintained their quality parameters within a year under low-temperature storage at 4°C and at room temperature, indicating their suitability for long-term use in quality control protocols. The successful development of fish meal quality control samples with demonstrated homogeneity and stability provides a valuable resource for the aquafeed industry. These samples offer a reliable reference material for assessing and maintaining the quality of fish meal used in feed formulations, ultimately contributing to improved feed efficiency and the health of aquatic organisms. Further research could focus on expanding the range of quality parameters assessed and optimizing storage conditions to enhance sample stability.

Keywords: Fish meal, Homogeneity, Stability

Food Proficiency Testing in Korea

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The Korean Testing & Research Institute (KTR) is a proficiency testing provider accredited by KOLAS and manufactures PT items for the Korean Ministry of Food and Drug Safety (KMFDS). In compliance with KMFDS regulations, designated testing and inspection agencies must establish proficiency testing plans to ensure the reliability and accuracy of their results as well as participating in the proficiency testing conducted by either KMFDS or external providers. This presentation aims to showcase the array of proficiency items developed by KTR for KMFDS between 2020 and 2024, comprising 23 test items across four areas of food standards and specifications including heavy metals, preservatives, pesticide residues, and microorganisms. Since 2013, KMFDS has conducted proficiency evaluations in the field of food and pharmaceuticals through quantitative and qualitative assessments. The quantitative evaluations rely on z-scores, categorized into three performance levels; Good, Caution and Insufficient. The z-scores are calculated using the average values from participating agencies. In the event of Insufficient results, participating agencies are obliged to take the necessary measures to perform investigations for corrective actions. This highlights the significant role of KTR in upholding food safety standards in ensuring the reliability of testing and inspection practices in Korea.

Keywords: Proficiency Testing, Food, Korea

Food description in food safety: cadmium risk and nutrient benefit in fish

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Introduction: Standardized dietary data are essential for assessing nutritional content and risks from harmful substances like unsaturated fatty acids, vitamin B1, and heavy metals in fish. In Taiwan, the National Food Consumption Database (NFCD) utilizes the Food Description and Classification System to integrate and standardize food information, allowing users to perform risk assessments, such as evaluating the carcinogenic risk of grilled or fried foods.

Objective: This study aims to use the mean adequacy ratio (MAR) to qualitatively integrate the risks and benefits of unsaturated fatty acids, vitamin B1, and cadmium from fish consumed by the Taiwanese population between 2013 and 2020.

Method: Data from the 2013-2020 Nutrition and Health Survey in Taiwan (NAHSIT) for adults aged 19-70 years were integrated into the NFCD. We performed the qualitative integration of risk and benefit based on the Benefit-Risk Analysis for Foods (BRAFO) framework. The MAR was used to assess nutrient adequacy, with MAR ≥ 0.75 indicating sufficient intake. The Hazard Index (HI) was used to evaluate cadmium risk, with HI ≤ 1 deemed acceptable. Cadmium data were sourced from the Taiwan Food and Drug Administration, and statistical analysis was performed using SAS software.

Results: The 95th percentile of fish consumption was 149.54 g/day (2013-2016) and 151.74 g/day (2017-2020) for males, and 111.06 g/day (2013-2016) and 115.26 g/day (2017-2020) for females. The HI for cadmium remained within acceptable levels, with the highest value being 0.0059648 for females in 2017-2020. The MAR, representing the nutritional assessment of unsaturated fatty acids and vitamin B1, was 7.5246719 and 8.2278764 for males and 5.7167599 and 6.3035199 for females in the respective periods of 2013-2016 and 2017-2020.

Conclusion: The study establishes a method to integrate food description and classification system with the BRAFO framework, providing valuable data for research in nutrition and food safety risk
assessment.

Keywords: benefit-risk analysis for foods, food classification and description system, Mean Adequacy ratio

Determination of Glyphosate Residues in Cereal Grains by Ultra Performance Liquid Chromatography (UPLC-MS/MS)

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Abstract

Glyphosate is a non-selective herbicide that is widely used around the world nowadays. It targets a broad range of weeds and important in the production of fruits and vegetables. Glyphosate is a phosphonic acid resulting from the formal oxidative coupling of methyl group of methylphosphonic acid with the amino group of glycine. Due to its widespread us, trace amounts of glyphosate residues may be found in various fresh fruits, vegetables, cereals and other food. The objective of this method is to analyze glyphosate residue in cereals grains. This method is employed for sample preparation of cereal grains for Glyphosate analysis. The glyphosate residue is extracted from the homogenous and representative sample using 1% Formic Acid in Methanol followed by centrifuging it. After centrifugation, the extract is filtered and analysed by Ultra Performance Liquid Chromatography-Tandem Mass Spectrometry UPLC-MS/MS. Matrix-matched calibration standards are used to construct a calibration curve and Glyphosate 13C2, 15N is used as the internal standard (ISTD). Confirmation of data is by the multiple reaction monitoring (MRM) of the precursor ion and product ions and comparing the ratios obtained against that of the reference standards. The method has been internally evaluated on the basis of validation parameters such as working range, linearity, detection and quantification limits, sensitivity, precision and measuring uncertainties. For the determination of glyphosate residues, this method has proved to be specific and selective with a precision of RSD ≤ 20% and LOD of 0.0004 mg/kg as well as recovery rate from 79% to 119% for corn meal, oat or rice samples. In conclusion, this method described the detection, quantification and confirmation of Glyphosate residue in cereal grain samples by UPLC-MS/MS ranging from 1 ng/mL to 100 ng/mL.

Keywords: Glyphosate Residue, UPLC-MS/MS

Evaluation of pesticide residues in selected vegetables and assessment of washing methods

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The increased demand for vegetables driven by population growth has led to widespread pesticide usage. These pesticides may constitute health risks to humans due to pesticide-contaminated vegetables. In this study, 60 vegetable samples sourced from the local markets in Kuala Lumpur were analysed for ten pesticide residues (chlorpyrifos, profenofos, aldrin, endrin, cypermethrin, lambda-cyhalothrin, carbendazim, propamocarb, imidacloprid, and thiamethoxam) using modified QuEChERS (quick, easy, cheap, effective, rugged, and safe) coupled with gas chromatography-tandem mass spectrometry (GC-MS/MS) and ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS). Validation of the method was conducted according to the European Union SANTE/12682/2019 guidelines for the following parameters: linearity, recovery, the limit of detection (LOD) and limit of quantification (LOQ). Results indicated that the tested pesticide analytes have recovery results within the range of 70 to 120%, which fulfills the acceptable mean recoveries for initial validation according to guidelines. The findings of the study also revealed that pesticide residues exceeding the maximum residue limits (MRL) were detected in 8 samples (13.3%), 33 samples (55.0%) contained residues less than MRL, and 19 samples (31.7%) were not detected. This study also evaluates the effectiveness of several pesticide reduction methods (tap water, 10% sodium bicarbonate solution, and 10% acetic acid solution). The results indicated that a 10% acetic acid solution was the most effective (76.0%, 41.2%); whereas tap water was the least effective method (35.7%, 21.7%) in reducing carbendazim and chlorpyrifos residue in kale. Thus, it is recommended that consumers practice a simple washing method by soaking vegetables with an acidic solution followed by rinsing with tap water to reduce pesticide residue and minimise exposure associated with health hazards.

Keywords: Pesticide, pesticide residues, QuEChERS, washing

Multi-Residues Pesticides Analysis in Root and Tuber Vegetables using QuEChERS Method by Gas Chromatography-Tandem Mass Spectrometer (GCMSMS)

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This method described the detection, quantification and confirmation of the pesticide residues in various root and tuber vegetables by Gas Chromatography-Tandem Mass Spectrometer (GC-MSMS). The representative root and tuber vegetable samples used for the study are carrots, potatoes and sweet potatoes. Sample preparation employs the QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) method.

A method was validated for the multi-residue analysis of 29 pesticides in root and tuber vegetables at ≤ 5 ng/g level. Root and tuber samples (15 g) are extracted from the homogenous and representative sample using 0.1 mg/L of triphenyl phosphate (TPP) in 1% acetic acid and 99% acetonitrile followed by liquid-liquid partitioning by adding anhydrous magnesium sulphate and sodium acetate. After centrifugation, the extract is decanted into a tube containing primary secondary amine and magnesium sulphate which constitutes a clean-up procedure via dispersive solid-phase extraction. Subsequent analysis is performed using GC-MSMS. Matrix-matched calibration standards are used to construct a calibration curve and TPP is used as the internal standard.

Method verification includes assessments of linearity, limit of detection, precision, accuracy and recovery. The matrix-matched calibration curve exhibits linearity within the range of 5 ng/mL to 200 ng/mL with a coefficient of determination (R 2) > 0.999. The limit of detection was determined to be 0.3 ng/g to 2.8 ng/g and the limit of quantitation was 5 ng/g to 28 ng/g. Recoveries of 29 pesticides were within a range of 70 to 120% with a relative standard deviation <20%. Measurement uncertainties for all targeted pesticides range from 12 to 28%.

Keywords: QuEChERS, multi-residue, Gas Chromatography-Tandem Mass Spectrometer, dispersive solid-phase extraction

Determination of sibutramine in food supplements by GC-MS

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The surge in consumer usage of food supplement products has raised concerns, as some of these items have been found to contain drugs that pose significant health risks such as liver failure, kidney failure, and heart disease. Among these drugs, sibutramine is commonly misused for weight loss promotion, despite its inclusion in the Poisons Act 1952, which prohibits its use in any food products. In this study, a simple, qualitative, rapid and reliable method was developed and validated for the identification and determination of sibutramine in food products comprised of liquid, semi-solid and solid samples. Samples were diluted with methanol and analyzed using Gas Chromatography Mass Spectrometry (GC-MS) data system equipped with a standard library. Confirmation for targeted sibutramine compound is performed for the selected ion at m/z 114, m/z 72 and m/z 58. The analytical method was internally validated according to the following validation parameters including linearity and limits of detection (LOD). This method demonstrates specificity and selectivity for sibutramine determination. Precision, assessed by RSD was 3.8%, with recovery ranging from 92% to 98% and LOD was established at 2.15 mg/L.

Keywords: Sibutramine, drug, food supplement, GC-MS

Characterization of the new PAL micro-SPE cartridge for pesticides extract clean-up

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A new µSPE cartridge was introduced; a novel septumless cartridge design dedicated to a reliable high throughput automation for extended application range. In this poster, the evaluation of the new cartridge design is presented with results for pesticides analysis at routine laboratories. A typical sorbent mixture used for clean-up of QuEChERS extracts consists of 20 mg anhydrous MgSO4, 12 mg each of C18 and PSA, and 1 mg GCB. The clean-up procedure was carried out by a PAL RTC System which online hyphenation with GC-MS or LC-MS instrumentation. The optimization and limits of the QuEChERS extract load volume and load speed with respect to the clean-up performance were discussed. Recoveries were obtained in the range of 80-120% for 90-96% of 252 pesticides and environmental contaminants, depending on matrix, with typical RSDs of < 5%. The reduction of matrix effects was evaluated using LC-MS analysis. The observed matrix effect using automated µSPE was considered low, with < 20% for more than 50 percent of the 243 studied compounds. In conclusion, the novel septumless PAL µSPE cartridge design showed high reliability in automated and fast high throughput workflows with excellent clean-up results and improved recoveries for GC-MS and LC-MS.

Keywords: Automated QuEChERS clean-up, µSPE cartridge, pesticides

Quality evaluation on food paste products based on type of packaging

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Paste-based food products commonly present in traditional cuisine are in great demand in the Malaysian food industry. This type of product has been produced by many local small and medium entrepreneurs in various types of packaging and ingredients. These products mostly are produced in the form of ready-to-eat (RTE) or ready-to-cook (RTC) food for the convenience of consumers. This study aims to evaluate the product quality of food paste products based on the different types of packaging received by MARDILab from 2021-2024. A total of 59 samples containing spices and chillies were selected, 29 samples packaged in glass jar, 17 samples in aluminium pouches and 13 samples in plastic material. Samples were subjected to Total Plate Count (TPC), Yeast & Mould Count, and coliform & E. coli count. To determine the sample quality, Badan Pengawas Obat & Makanan (BPOM) Regulation 2019, was used as a reference, where the acceptable limit for maximum bacterial contamination for paste (bumbu & kondimen) is 1.0 x 10 4 CFU/g. From the TPC analysis, plastic packaging products showed no exceeded limit of TPC (0%), followed by aluminium pouches (6%) and glass material (17.2%). All samples found no presence of yeast and mould, coliform and E.coli except one sample in a glass jar contained mould and one sample in an aluminium pouch contained coliform. To provide a better overview of the quality and safety of paste-type food products, it is suggested to include Bacillus cereus enumeration and also food processing information.

Keywords: food paste product, food quality, ready-to-eat product, contamination

Laboratory Accreditation Requirement

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Accreditation is a process by which an authoritative body gives formal recognition that an organization is competent to carry out specific tasks. Accreditation is given based on laboratory capability to perform tests and provide reliable results. Accreditation serves as a way to have proper control of laboratory processes, thereby minimizing errors. It underlines the credibility of services and results delivered by the laboratory to obtain customer satisfaction. To obtain accreditation, a laboratory shall have a policy document known as a quality document, appoint a Quality Manager and Technical Manager as well as establish a Quality Management System. The laboratory shall establish the relevant quality indicators and continual improvement to fulfill the requirements for accreditation. In conclusion, accreditation provides a framework for the laboratory to enhance its Quality Management System, ultimately earning trust from customers.

Keywords: Quality Management System

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