FoodTech Insights

The official magazine of Sabaragamuwa University
Food Science & Technology Association

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Industry 4.0 : The Era of Smart Food Manufacturing

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SUFSTA

Magazine Committee

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Contents

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Editor's note

Dear Reader,

Welcome! It is with great pride and delight that I announce the publication of the inaugural issue of 'FoodTech Insights' (FTI) magazine which marks the beginning of what we hope will be a long-lasting endeavour from the Department of Food Science and Technology, Sabaragamuwa University of Sri Lanka for the benefit of the Food Science and Technology community. FTI is published by the Sabaragamuwa University Food Science and Technology Association (SUFSTA) and primarily contributed by the views and thoughts of undergraduate students from virtually all universities in Sri Lanka where food science related degrees are offered. FTI aims to provide an inclusive vehicle for undergraduates to communicate the knowledge gathered, opinions and thoughts for the benefit of an ever more vibrant food science community.

Many undergraduates are budding writers and yet they find it difficult to publish their work in professional journals and magazines. FTI also intends to address this gap and create a forum to share their knowledge in the discipline. The experience of preparing an article for a professional magazine will be a rewarding exercise for the undergraduates which will not only stimulate their critical and analytical thinking skills but also the academic and technical writing skills, thereby facilitating their professional development. We truly believe that a publication of this nature would encourage undergraduates to participate in a scholarly exercise, which would be a key element in the process of developing a graduate capable of promoting the advancement of the discipline of Food Science and Technology. In addition to the focus articles, the inaugural issue also includes guest articles by academics, a success story of an alumnus and an interview with an eminent food science professional in Sri Lanka.

FTI is now a reality due to the outstanding contribution and untiring efforts of our editorial team irrespective of a host of challenges posed by the COVID-19 pandemic which may have been curtailing our freedom of movement but not our minds and creativity. I would also like to express my sincere gratitude to all the authors of the articles, content reviewers, the editorial advisory board and the office bearers of SUFSTA for their time and unfailing support in bringing out this inaugural issue of FTI and look forward to their unrelenting support in future. Our sponsor Neochem International (Pvt) Ltd is gratefully acknowledged for their generous sponsorship for this inaugural issue.

I hope you enjoy reading 'FoodTech Insights'.

Sincerely

Chathudina J. Liyanage
Editor

MESSAGE FROM THE VICE CHANCELLOR

SABARAGAMUWA UNIVERSITY OF SRI LANKA

Prof. Udaya Rathnayaka

I am pleased to send this message to the inaugural issue of the 'FoodTech Insights' magazine published by the Sabaragamuwa University Food Science and Technology Association.

This kind of a publication is a very good initiative to enhance the knowledge of the wider Food Science and Technology community, in areas relevant to current technical know-how and professional outlook. Thus, I am very glad to note that our undergraduates have gone beyond the traditional role and have ventured out to prepare and publish a magazine in which contemporary knowledge of the discipline can be shared with all stakeholders in the field and the general public to broaden their perspective.

Furthermore, I am especially glad that the launching of the magazine coincides with one of the important landmarks being celebrated this year-the Silver Jubilee of the University. I am confident that the initiative taken by our undergraduate students to publish the 'FoodTech Insights' magazine augurs well for the future of the University in its path to excellence, in keeping with its mission to search for and disseminate knowledge, promote learning, research and training.

I take this opportunity to congratulate the editorial team for their impressive work to launch the magazine despite the COVID-19 pandemic and ensuing challenges.

MESSAGE FROM THE DEAN

FACULTY OF APPLIED SCIENCES

Dr. Rasangi Sabaragamuwa

It is always a great pleasure to see creativity and inspiration in our undergraduates and their sense of responsibility in giving back to the society. This magazine is a commendable outcome of such positive thoughts and leadership by the SUFSTA, the subject association of the Department of Food Science and Technology with excellent expertise guidance by the department staff.

Belonging to this same food family it is with much pride I write this message, at the launching of the first issue of FoodTech Insights, as the Dean of the Faculty of Applied Sciences.

Food Science and Technology is a dynamic and growing discipline, where trending and must-know emerging issues are always there mainly due to the socio-economic changes, even climate related changes, technological developments in manufacturing and related sectors, shifting of consumer choices and dietary patterns, varying nutrition and health concerns, updates in regulatory frameworks, and more importantly everyday new innovations and discoveries in this research arena.

I am certain that this magazine will bring about a platform to share this up-to-date knowledge related to food science and technology, while sharing students' perspectives and contributing to their learning experience.

Moreover, this magazine will create awareness, generate interest and increase the visibility of our honours degree programme in food science and technology, one of the pioneering degrees offered in this discipline by Sri Lankan universities.

I thank all our enthusiastic undergraduates, SUFSTA office bearers, all the staff of the department, coordinators, the editorial board, reviewers and especially the writers for their productive contribution to this publication.

I wish this inaugural issue be a successful first step in fascinating must-read biannual magazine.

MESSAGE FROM THE HEAD

DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY

Dr. WSM Senevirathne

It is a great pleasure to issue a congratulatory message at the occasion of launching the first volume of the "FoodTech Insights" magazine bringing out by the Sabaragamuwa University Food Science and Technology Association (SUFSTA) which provides the students a forum to express their innovative ideas, thoughts and their experiences during the course of their stay at SUSL. It has been learnt that SUFSTA students have organized a number of community development programmes past few years and from this year onwards they have taken a decision to produce a magazine which will be helpful for both academics and the students other than that they are conducting at present to uplift the physical environment of students and community. Hence I would like to send my felicitations and best wishes to the organizers, officer bearers and members of the SUFSTA and also for a grand success of the event.

MESSAGE FROM THE PRESIDENT

SABARAGAMUWA UNIVERSITY FOOD SCIENCE & TECHNOLOGY ASSOCIATION

ACCD Neranjana

As a student association we always endeavor to share our knowledge on food science and technology among the community and raise awareness about the Degree Programme in Food Science and Technology at the Sabaragamuwa University of Sri Lanka. We have taken another significant step in this regard by launching the 'FoodTech Insights' magazine and we are pleased to have it organized and successfully completed.

The Vice Chancellor, the Dean, Faculty of Applied Sciences, the Head, Department of Food Science and Technology, Academic staff members of the Department, Alumni, my colleagues as well as undergraduates from other universities have contributed to the successful publication of this inaugural issue. As the president of the Sabaragamuwa University Food Science and Technology Association, I would like to express my sincere gratitude to all of them.

Thank you for reading our magazine and we hope you enjoy this issue.

Do you know what you eat?

It is worthy to know...!

Janaka Wijesinghe | Professor in Food Science and Technology | Department of Export Agriculture | Faculty of Animal Science and Export Agriculture | Uva Wellassa University of Sri Lanka.

The use of food additives is not a modern-day invention. From the ancient times people use food colors, flavors and various other additives in order to get numerous functions during preparation of day-to-day meals. However, as the 20th century progressed, the public's demands for foods of high quality and convenience is increased. Moreover, much controversy exists regarding the safety of some food additives. From a technological point of view, food additives play an important role in the development of processed foods. On the other hand, the use of food additives is an exciting topic which provokes consumer concern. Food additives are chemicals added to a particular food to serve a particular technological or sensory function during processing or storage which could affect the characteristics of the food or become part of the food. According to definition, food additives are substances of natural or synthetic origin that are not consumed as a food or as a typical ingredient of food. Therefore, food additives are substances which purposely added to foods to; prevent spoilage, improve organoleptic properties, improve nutritive value, improve appearance, etc.

Food additive safety has received extensive attention in recent years. Anything consumed in excessive amounts will be harmful or even toxic. The controlling factors in determining the safety of substances are quality and quantity. Consequently, food additives must be considered effective, safe and measurable in order to be used in a food product. Furthermore, food additives should be 'food grade' and hence all the food additives must be Generally Recognize as Safe (GRAS) chemicals. Thousands of food additives are currently approved for use. Avoiding or minimizing toxins in diet is an important step towards enhancing our health and lowering the risk of non-communicable diseases. Effects of some food additives may be immediate or may be harmful in the long run if we have continuous exposure. Long-term effects may increase the risk of cancer, cardiovascular disease and other degenerative conditions.

Ingredients and additives should be appeared on the food label and many foods are now labelled with additional information such as nutritional facts as well. Further, labels contain information such as traffic light colour coding to help you make decisions. Traffic light colours provide information about foods at a glance if they are high (red), medium (amber) or low (green) in fat, sugars and salt. Generally, consumers have low levels of knowledge or awareness about food additives. Very rarely they check the information available on the label when they purchase food products from the market. But it is worthy to be aware what we eat. However, in recent years, particularly after revealing of various incidences of food adulteration, consumers are becoming increasingly cautious about food safety.

Among the numerous matters associated with food safety, food additives are within those that are more controversial. Both true and false information on food additives is available to consumers. Unfortunately, widely held but false believes or myths are also existing in the society. Therefore, consumers' food choice is believed to be greatly influenced by how they judge the available information. However, the awareness of consumers on the available information is questionable. Even though food additives are listed on the labels, as consumers people usually do not check them. Not only that but also, people do not have clear idea about the International Numbering System (INS) of food additives (Table). Taken together, when you are buying foods, it is a good idea to check the label for available information on it.

Table: The generic list of E numbers / INS of food additives

Block of numbers	Food additive
E100-E199	Colours
E200-E299	Preservatives
E300-E399	Antioxidants and acidity regulators
E400-E499	Thickeners, stabilizers and emulsifiers
E500-E599	Anticaking agents
E600-E699	Flavour enhancers
E700-E799	Antibiotics
E900-E999	Glazing agents and sweeteners
E1000-E1599	Additional chemicals

Exposé

DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY

The Department of Food Science and Technology of Sabaragamuwa University of Sri Lanka is one of the leading departments in the Sri Lankan university system conducting a BSc. Honours Degree (four years in duration) in Food Science and Technology. The programme initially started as a diploma course in Buttala Affiliated University Collage (BAUC) in 1993 and later upgraded to a fully-fledged bachelor's degree in 1996 when the BAUC was elevated as the Faculty of Applied Sciences of Sabaragamuwa University of Sri Lanka. Since 2007, the degree programme is administered by the Department of Food Science and Technology with major expansions in laboratories and other facilities. This year the degree programme marks its silver jubilee as the longest-running bachelor's degree in the discipline of food science and technology in Sri Lanka.

The students enrolled in the degree programme are exclusively selected from the G.C.E. (Advanced Level) Bio Science stream. Our undergraduates are offered an up-to-date curriculum covering theoretical and practical aspects in a broad spectrum of scientific fields covering biological, microbiological, chemical, physical, sensory, nutritional, and engineering properties of food/food commodities and their processing technologies delivered through lectures, lab sessions, field and industrial visits and research projects. As a result, our graduates enjoy an employability rate of about 75% in the relevant sectors.

Our graduates are well suited for many food industry, academic and research and development careers, including various administrative, executive roles in the local and foreign food industry. There are numerous graduates who contribute to food industry as entrepreneurs.

The Food Science and Technology Association of Sabaragamuwa University (SUFSTA) is the student association of the department including all enrolled undergraduates. The Association aims to foster the develop students' professional career, enhance student knowledge and unity among the students. The association conducts annual events such as: running an exhibition stand in the Profood-ProPack exhibition, conducting social and welfare programmes ('Sipsara'- education enrichment programme for rural schools), organizing workshops and seminars on a wide range of topics engaging with the industry to celebrate special events such as World Food Day and other prgrammes (i.e. quiz competitions, etc). SUFSTA also organizes an annual alumni get-together Extending its mission of knowledge dissemination to the Food Science and Technology community via various channels, SUFSTA has taken the initiative to launch a magazine concurrent with the silver jubilee celebration of the Sabaragamuwa University of Sri Lanka as well as the degree programme itself.

The dark side of the fast foods

D.M.S.M.Dasanayake | Department of Food Science &Technology | Sabaragamuwa University of Sri Lanka

Nowadays peoples spend a busy lifestyle. They tend to increasingly take "fast foods" at restaurants. It's likely that many people have eaten fast foods at least once. Fast foods are characterized as quick, easily accessible, and cheap alternatives to home-cooked meals, according to the National Institute of Health, USA (NIH). They also tend to be high in saturated fat, sugar, salt, and calories. Pre-packaged snack food, chocolates, and packaged sweets, carbonated soft drinks, and fast food like pizza and burgers are all examples of junk food (Fast food and junk food aren't interchangeable terms and using them as such confuses people who want to eat healthily. Not all fast food is bad for you, and some junk food isn't really 'fast' as well). Manufacturers process the raw ingredients, often adding hydrogenated oils, trans-fats, and monosodium glutamate (MSG) to enhance taste and prolong the shelf life of the product.

Why do people take fast food, even when they don't have good nutrition quality? There is much fast food that is easily available, convenient, needs little or no preparation, and is usually consumed on the go. Just what a young person is looking for! Children, especially over 12 years of age, tend to eat away from home much more than kids did 20 years ago. Fast food is often the default choice. Not only is it convenient and easy to grab, but it's also tasty and cheap. And fast-food joints also serve as great teenage hangout places. (The Hindu) There is a relationship between stress and fast food consumption. Stress causes certain regions of the brain to release chemicals (specifically, opiates and neuropeptide Y). In other words, when you get stressed, your brain feels the addictive call of fat and sugar and you're pulled back to junk fast food. (Sánchez-Villegas et al.)

Fast food consumption changes both the psychological and physical status of consumers. Exposure to fast-food symbols can automatically increase participants' reading speed when they are under no time pressure and that thinking about fast food increases preferences for time-saving products while there are potentially many other product dimensions to consider. More strikingly, some researchers found that mere exposure to fast-food symbols reduced people's willingness to save and led them to prefer immediate gain over a greater future return, ultimately harming their economic interest (Zhong and DeVoe). A high intake of fast foods may cause many health issues because these foods contain harmful chemical substances like trans fats. A high intake

of trans-fat can raise low-density cholesterol levels and increase the risk of cardiovascular disease. Trans-fats are mostly found in fast food items like French fries, cakes, hamburgers, and in packaged foods such as crackers, chips, cookies, and biscuits. Further, high consumption of fast foods may cause overweight and obesity. Fast food advertisements, restaurants, and menus all provide environmental cues that may trigger addictive overeating (Garber and Lustig). Thus simultaneously people consume fast foods over and over. A study found an association between eating fast foods three or more times per week and wheeze and asthma among adolescents in South Africa. Unhealthy diets play a crucial role in respiratory health among adolescents; healthy eating habits are encouraged to reduce the burden of respiratory symptoms and diseases (Nkosi et al).

Some researchers have found a relationship between energy drink (ED) consumption and fast food consumption. According to them, "The logistic regression analysis showed that high energy-dense fast foods consumption was a significant predictor for ED consumption among students. Students who consumed high energy-dense fast foods 1 to 5 times per week were more likely to consume EDs" (Almulla and Faris). Nowadays students tend to eat fast foods. The majority of college-going adolescents consume fast foods. There is a positive association between fast-food consumption and obesity. Therefore, it is recommended to limit fast food consumption (Banik et al.)

As fast foods are poor in nutritional value, there should be a change in the food market which includes increasing the availability of healthy foods. A combined effort from families, colleges, and the government is essential to control the epidemic. Student cafeteria and outside food outlets should be encouraged to provide healthy foods.

Finally, manage your diet plan and reduce fast food consumption ."Be healthy. Be active"

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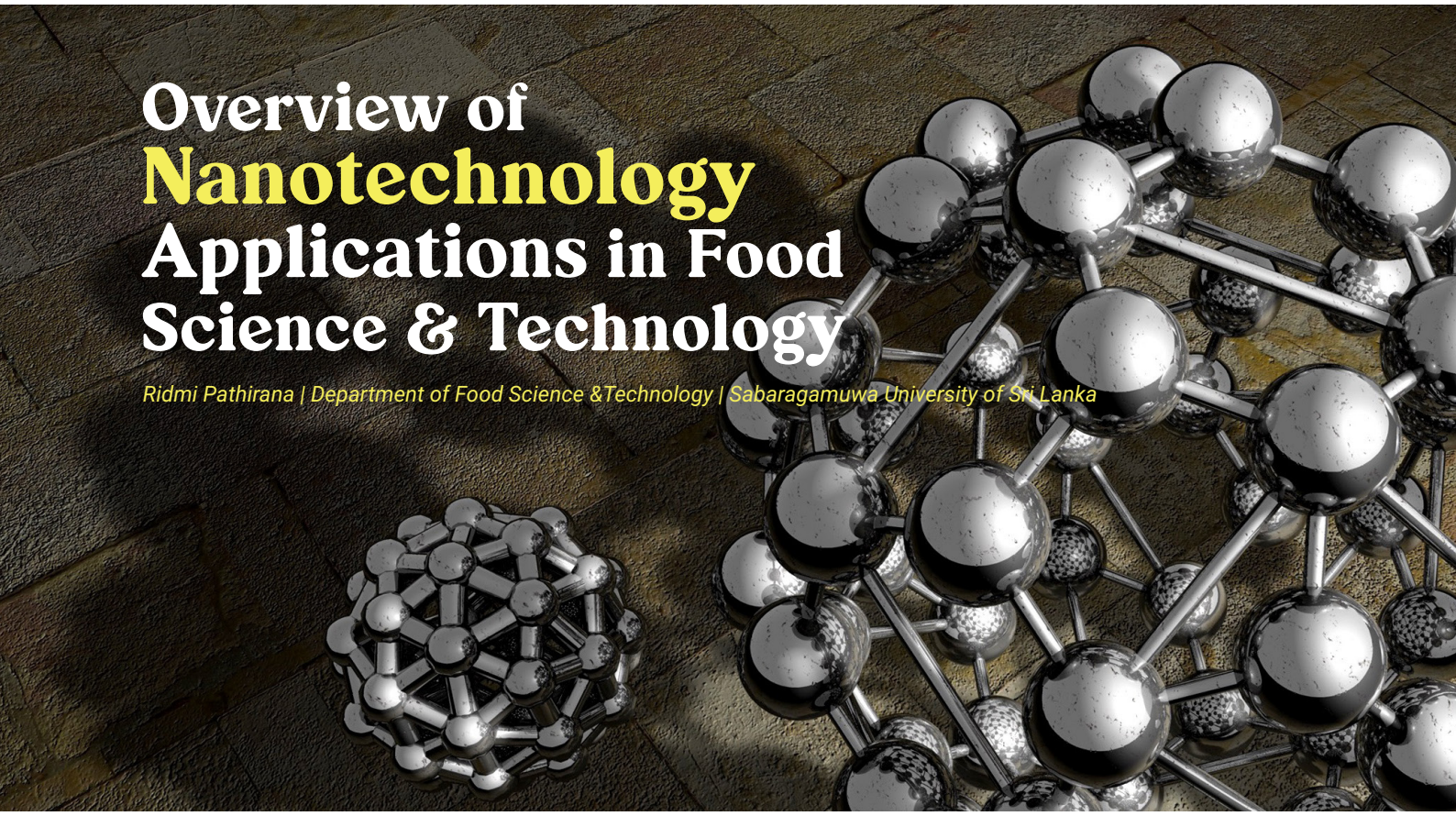
You Are How You Eat: Fast Food and Impatience [Chen-Bo Zhong and Sanford E. DeVoe University of Toronto]



Overview of Nanotechnology Applications in Food Science & Technology

Ridmi Pathirana | Department of Food Science &Technology | Sabaragamuwa University of Sri Lanka

The innovations of nanotechnology have transformed number of scientific and industrial areas including food industry. Nanotechnology has been reported as the new era of industrial revolution. Both developed and developing countries are investing on this technology to secure a market share. The definition of the nanotechnology is the creation, utilization, and manipulation of materials, devices or systems at the nanometer scale. Nano-materials are materials smaller than 100nm and have unique properties than their macromolecules due to their high surface to volume ratio and novel physicochemical properties such as color, solubility, and thermodynamics. The applications of nanotechnology in various fields of food science and food microbiology including food processing, food packaging, functional food development, food safety, detection of foodborne pathogens and shelf life extension of food products are reported.

In flavor control, nanotechnology can be used. Flavors are important quality aspects in any kind of food and influence the consumption of foods. It is difficult to control and stabilize the flavors mainly during storage and manufacturing processes. To limit the flavor loss during storage and processing, it is useful to encapsulate flavors before use in foods. Encapsulation improves chemical stability and provides controlled release of flavor. Encapsulation with a protective carrier guards against interactions between flavors and reactions induced by light and oxidation. But nanoencapsulation packs substances into nanocarriers and provides controlled release of core materials. With properly designed controlled release systems such as sustained release and burst release, the flavors can be released at desired time at a desired rate. Therefore, nanocarrier encapsulation provides the sustained release of the flavor compounds maintaining the flavor quality during the shelf-life.

Nanotechnology is widely used to enhancing the bioavailability of bioactive compounds, . In producing functional foods, availability of bioactive compounds is important. Bioavailability means the

amount of bioactive compounds that can enter the bloodstream. When bioactive compounds are ingested by mouth, they should pass mouth, stomach, and intestines to access the bloodstream. It is necessary to protect against gastro-intestinal environment, increase the stability and their absorption by epithelial cells to improve the bioavailability. Several target delivery systems using nanocarriers have been developed to improve the bioavailability of various bioactive compounds. These bioactive compounds can be categorized as lipophilic and hydrophilic based on water solubility. Most of the lipophilic bioactive compounds such as poly- saturated lipids, fat soluble vitamins, carotenoids are low in availability within the human digestive tract due to poor absorption in the gastrointestinal fluids. Therefore these bioactive compounds should be encapsulated. Nanocarriers provide an increased surface area and enhance solubility and bioavailability of the encapsulated bioactive compounds when compared to micro size carriers. For example, the bioavailability of β- carotene encapsulated within an oil in water nanoemulsions is increased with decreased particle size.

Another field that nanotechnology is used in the food industry is the detection of deleterious substances in foods. Nanosensors are important in this field. These devices may be able to detect and quantify low concentrations of pathogens, organic compounds, and other chemicals. In addition, these devices have potential to exhibit high sensitivity, fast response, and recovery and integrate addressable arrays on a large scale. An example for application

of nanosensors is the detection of organo-phosphate pesticide in fruits and water . Nanosensors have also been used for pathogen and mycotoxins detection in foods. Though conventional control of these microorganisms is complicated, nanosensors can rapidly detect toxins and pathogens in food, during processing and storage.

Food packaging is thought to be the main application of nanotechnology in the food industry. The addition of nanoparticles helps to improve the durability, temperature resistance, flame resistance, barrier properties, optical properties, and recycling properties of packaging materials. Nano-packaging can also be designed to release enzymes, flavors, antimicrobials, antioxidants, and nutraceuticals to extend shelf life. The usage of nanosensors in packaging materials can track internal and external circumstances of food products, vessels, and pellets. And this is one of the best solutions to minimize plastics usage in food industry.

This novel technology has brought many benefits for the food industry and some more applications are yet to be realized. Despite its various advantages, the rapid practice of nanotechnology in food sector has also raised public safety, environmental issues, ethical issues and regulatory issues. Nanomaterials may exhibit substantially different physicochemical and biological properties when compared to their conventional forms and these unknown properties may create unpredictable hazards. Therefore it is necessary to conduct more research to address these drawbacks of the technology and the development of food industry with the uptake of nanotechnology.

Animal Based Food Safety & Quality

D.E. Manawadu | Department of Food Science &Technology | Sabaragamuwa University of Sri Lanka

Production systems mainly focus on consumer needs and food quality. Food quality can be defined by food safety, nutritional value, and sensory and technological quality. Food safety is an important factor in animal breeding. Animal breeding and reproduction have limited direct possibilities in influencing food safety and public health. Indirectly, there are many possibilities in improving food safety; e.g. by decreasing the incidence of food-borne infections. With the internationalization of trade and increasing size of farms disease transmition through animal, semen, egg, and embryo transport has increased. The risk of disease transmission and ensuring safe transport of genetic material can be further reduced by improving health guarantees of the materials. A contributor to this issue can be Specific Pathogen Free (SPF) production of breeding animals. SPF animals are guaranteed free of particular pathogens or a certain disease.

Microbes pathogenic to humans can grow in the animal gastrointestinal (GI) tract, and they might or might not cause health problems in the animal. Physiologic stress increases the susceptibility of the animal to pathogens, cause the growth of pathogens in the GI tract, and their shedding into the fecal material of the stressed animal. These same pathogens can enter the human food chain when they are transferred to the surface of the meat during slaughter and processing.

Food safety arises from the disposition of carcass remains after removal of the edible meat, and from the disposal of animal fecal material. After the edible meat is removed, carcass remains are processed into other products used in a variety of applications, including food and medical uses. One of the main products is meat and bone meal (MBM), a supplement historically fed to high –production animals. Using MBM from infected cattle in animal feed can transfer bovine spongiform encephalopathy (BSE) to other ruminants, and ultimately, to consumers. Concern about BSE transmission in the United States has resulted in regulations forbidding the feeding of MBM to ruminants. Animal carcasses also are used in many other products. Collagen is processed into gelatin for confectionery products such as candies, capsules for pharmaceutical products, and a range of cosmetic products. Bone and connective tissues are used in bone grafts and hernia repair in humans. Therefore, concern for the safety of products derived from animals also must take into account the use to which carcass ruminants might be put once the edible portions are removed.

Different types of genetically engineered animals will be developed for food, and others will be developed primarily for producing non-food materials such as pharmaceuticals, vaccines. As for all foods or food products, those from genetically engineered animals should be evaluated for chemical or biological agents which affect the safety of the food for the human consumer. The expression of transgenes also might be intended to change the nutritional attributes or improve the safety of food products. For example, the expression of transgenes in milk might optimize milk composition, add neutraceuticals to milk, or reduce the incidence of infectious disease. Immunoglobulin a directed against viruses infecting the digestive tract might be expressed in milk, and viral antigens activated by oral administration might be used to vaccinate humans and animals against viral disease. Changes in these types raise a moderate level of food safety concern. Claims of nutritional attributes, safety, and efficacy of milk or other food products from transgenic animals must be demonstrated. Animals might be developed to produce food products designed to fit special human dietary needs. The nutrient profiles of meat and animal products are well documented, and changes in profile raise concerns.

The European Union(EU) has an integrated approach to assure a high level of food safety. This assurance is met through 'farm-to-table' measures, monitoring, and ensuring the effective functioning of the internal market. Another important aspect is the development of legislative and other actions; assurance of effective control systems and evaluates compliance with EU standards, manage international relations and manage relations with the European Food Safety Authority (EFSA). In this era of globalization, food production chains have grown longer and more complex, often involving multiple enterprises or even countries for the manufacturing of one product. International standardization of food production procedures and safety measures is therefore necessary for the safe trade of food products.

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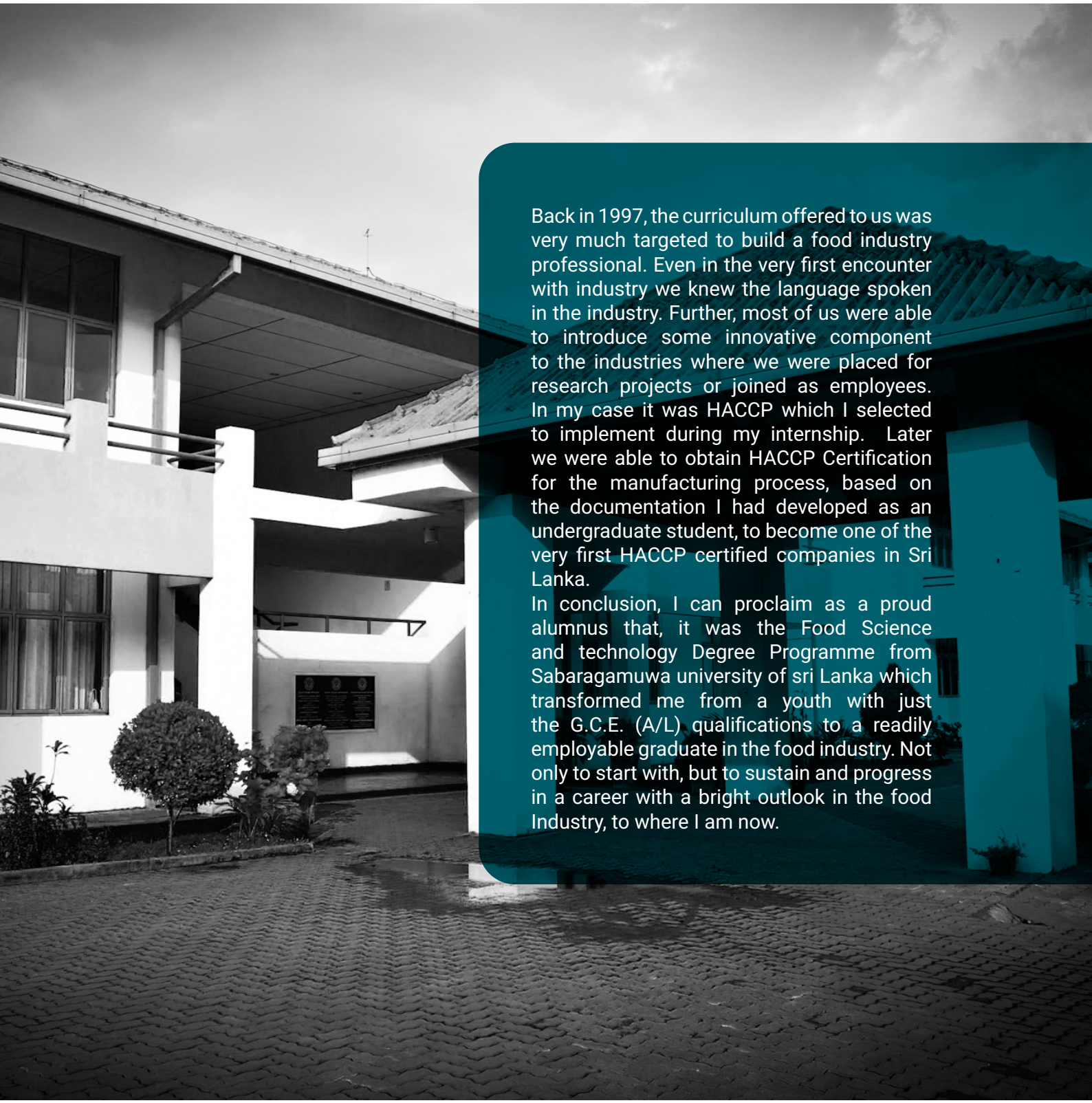
Alumni Perspective

INDUNIL AMARASENA

Production Manager (Ice cream)
The Colombo Ice Company (Pvt) Ltd.

It was the time where only 11,000 students were recruited to the entire university system of Sri Lanka in the year 1997, when the Affiliated University colleges were upgraded to National Universities. I was called to register with Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka. It was the first year of operations of Sabaragamuwa university as a fully-fledged national University and the Faculty of Applied Sciences was at Buttala in the Uva Province. After joining the Faculty as an undergraduate, I enrolled for the B.Sc. degree programme in Food Science and Technology. It was a full residential university experience at Buttala.

Back in 1997, it was a three-year degree programme, with subjects covering all most all content related to Food Science & Technology, also with a final year research project placement. This placement exposed me to the industry, already during the undergraduate tenure. I was fortunate to be placed in a leading food and beverage company in Sri Lanka for the final year research project. Having done very well in my research project and completing various other assignments by the company, I was offered an employment opportunity, even before the completion of my undergraduate studies. Immediately after the completion of studies, I joined the same company where I was an intern and continued to work there for the last 19 years, functioning at various executive and management levels with different responsibilities. I joined the company as a trainee executive and I now hold the position of Production Manager of a most modern and large-scale food manufacturing facility in Sri Lanka.



Back in 1997, the curriculum offered to us was very much targeted to build a food industry professional. Even in the very first encounter with industry we knew the language spoken in the industry. Further, most of us were able to introduce some innovative component to the industries where we were placed for research projects or joined as employees. In my case it was HACCP which I selected to implement during my internship. Later we were able to obtain HACCP Certification for the manufacturing process, based on the documentation I had developed as an undergraduate student, to become one of the very first HACCP certified companies in Sri Lanka.

In conclusion, I can proclaim as a proud alumnus that, it was the Food Science and technology Degree Programme from Sabaragamuwa university of sri Lanka which transformed me from a youth with just the G.C.E. (A/L) qualifications to a readily employable graduate in the food industry. Not only to start with, but to sustain and progress in a career with a bright outlook in the food Industry, to where I am now.

Food Quality and Safety Management Systems

T.N.D.Manawadu | Faculty of Agriculture | University of Peradeniya

Food quality and safety management systems are important features of the food manufacturing industry because in order to cope with the market needs and to meet the legal requirements, the producers have to satisfy both the quality and the safety criteria of the food products. These management systems are available in multiple options and different forms where the producers should decide the most appropriate one depending on the specific activity or the procedure.

Food safety is defined as the condition which ensures that food is free of hazards and that it will not cause harm to the consumer when it is prepared and/or consumed according to its intended use. Food quality is a total of traits and criteria which characterize food concerning its nutritional value, sensory value, convenience as well as safety (hazard free) for a consumer's health. Therefore food quality is a broader and a complex concept than food safety. The safety aspect itself is embedded in the concept of food quality. But it is also important to know the difference between "Food quality" and "Food health quality". Out of the four attributes in food quality, only safety and nutritional value are responsible for food health quality. Although food safety cannot be considered a totally independent criterion from food quality, the two aspects are managed separately. The reason for this is to place the safety factor first above all other aspects of food quality.

In order to ensure the safety and the quality of the food products, various safety and quality management systems have been developed. Each and every system comprises a systematic approach to ensure that food products have particular traits at any stage of production and distribution.

A quality management system (QMS) can be defined as a set

of coordinated activities to direct and control an organization in order to continually improve the effectiveness and efficiency of its performance. These management systems can be subjected to different classifications. One such classification is as follows,

- Quality Assurance systems which includes HACCP (Hazard Analysis. Critical Control Points) and the prerequisites such as

GMPs (Good Manufacturing Practices), GHPs (Good Hygienic Practices), GAPs (Good Agricultural Practices)
- Quality Management Systems (QMS) that refers to ISO or TQM (Total Quality Management)
- Integrated Systems (IS) such as ISO 22000.

The systems can also be classified according to the extent of activities they cover,

- Basic safety systems: prerequisites (GAPs, GMPs, GLPs, etc.)
- Advanced safety systems such as HACCP
- Integrated food safety management – ISO 22000
- Basic quality management systems - ISO 9001
- Advanced quality management systems - ISO 9004.

The classification of the systems can also be done as obligatory and voluntary systems. The obligatory ones are required by

law and the voluntary ones are not. The voluntary systems are implemented due to various reasons such as to meet the buyer expectations, to tackle with the other competitors in the industry, etc.

Obligatory systems include the ones related to safety e.g. GMP, GHP, HACCP etc. These obligatory management systems which have been established to assure food safety are also known as "Safety assurance systems". Voluntarily implemented systems, known as "Quality assurance and management systems" include Quality Assurance Control Points (QACP), ISO- 9000, ISO-14000 (environmental management) etc. Quality Assurance Control Points (QACP) is one of the quality assurance systems in food production, created based on the HACCP concept. In case of QACP, the control points, critical limits and parameters are quality related instead of being safety related e.g. sweetness in terms of amount of sugar.

It is important to distinguish "Assurance" from "Management". The term "assurance" is related to a product itself. It involves all the safety assurance systems (GMP, GHP and HACCP) and the quality assurance system QACP. The term "management" is related to a company's overall organization concerning the products' quality (including safety). It involves the remaining Quality Management Systems QMS (ISO-9000, ISO-14000, etc.) and TQM.

The successful implementation of food safety and quality management systems has become a necessity today. Therefore these systems are implemented either individually or in combination as recommended. Finally, it is essential to know to what extent the systems contribute to the total quality of the product and to balance the tools used for achieving the quality and safety objectives as necessary.

Flavor of Green Tea

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Green tea is a natural product possessing both dietary importance and health significance. It is derived from the tender leaves, buds and shoots of varieties the species Camellia sinensis (Linnaeus). Green tea, representing 20% of world's tea consumption, is produced after fixation, rolling and drying of tea leaves. The tea leaves retain the highest amount of fresh tea polyphenols (catechins, gallic acid, chlorogenic acid, and flavonols). Catechins (flavan-3-ols) are the most important polyphenols in green tea; their proportion is up to 25-35% (w/w) of the leaves and are responsible for the bitterness and astringency of tea. The flavor of tea can be divided into two categories: taste (non-volatile compounds) and aroma (volatile compounds). All of these aroma molecules are generated from carotenoids, lipids, glycosides, etc. precursors, and also from Maillard reaction. Young leaves grown under shade are tender and deep green with a high amino acids content but low flavones content.

TEA FLAVANOLS

The main polyphenols found in tea are flavonoids. Flavonoids are a group of bioactive compounds synthesized during plant metabolism. Flavonoids are found in fruits and vegetables, prominently in spinach, apples, and blueberries, as well as in beverages like tea and wine. Previous health-related research on tea has largely focused on the flavonoid group. Flavonoids contain two six- carbon rings linked by a three-carbon unit, which is also known as a chalcone structure. The main catechins in tea are: catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin-3- gallate, and gallocatechin. Catechin content in tea differs by tea type or style. Catechins in green tea are relatively stable since they do not go through oxidation during processing, and are what gives green tea its characteristic bitterness and astringency.

VOLATILE COMPOUNDS THAT AFFECT THE FLAVOUR OF GREEN TEA

About 600 volatile compounds have been identified in green tea. Respectively 66 volatile compounds can be found in roasted green tea. Pyrazines are major components of roasted flavour. Spring green tea is made from tea leaves which grow in shade. Alpha-ionone, β-ionone, 2,6,6-trimethylcyclohex-2-en-1- one, 4-(2,6,6-trimethyl-1,2-epoxycyclohexyl)-e-buten-2-one, and cis-2-pentenol are dominant volatile compounds that enrich the flavour of spring green tea. Spring green tea from Japan has aroma compounds of linalool, octanol, cis-3-hexenyl-hexanoate, α-terpineol, β-sesquiphellandrene, linalool oxides, calamenene, geranylacetate, benzylalcohol, β-ionone, cis-jasmone, 5,6-epoxy-β-ionone, nerolidol, dihydroactinidiolide, and indole. Vietnamese green tea is the most popular tea in Japan because of its briskness, suggesting that cis-3-hexe-1-ol, hexanoate, trans-2-hexenoate, and dimethyl- sulfide contributed to the briskness. Chinese green tea is pyrazines, linalool oxides, carboxylic acids, lactones, geraniol, 2-phenylethanol, and ionone. Volatile fractions of various green teas have more than 50 active aroma compounds, including ones that could yield nutty, popcorn-like, metallic, floral, meaty, fruity, potato, green, cucumber-like, and hay-like characteristics. The most active of these catechins is epigallocatechin gallate (EGCG).

NON- VOLATILE COMPOUNDS THAT AFFECT THE FLAVOUR OF GREEN TEA

Most desirable tea is abundant in various components like catechin, caffeine, and amino acids. Catechins are a type of polyphenol that can be found in the tea plant itself. It is a flavonoid, with a C6-C3- C6 structure. There are eight different types of catechins: catechin, epicatechin, gallocatechin, epigallocatechin, epicatechin gallate, catechin gallate, epigallocatechin gallate, and gallocatechin gallate. Tannin has a strong astringent or pungent taste. Caffeine is the stimulant in green tea. It is vital in tea flavor and briskness. The amino acids in green tea are a major factor in its quality with about 20 different amino acids contributing to the overall content. Theanine accounts for more than 60% of the amino acids; theanine, glutamic acid, asparagines, arginine, and serine account for about 90% of total amino acids.

How to taste a wine correctly? (Sensory Evaluation)

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First of all, what is a wine? In simple definition wine is the preserved juice of grapes. Thousands of grape varieties are used for wine production. But wine does not exactly taste like the grape that it came from. Therefore, wine is actually a complex translation, transformation, biosynthesis of elements found in the grapes to a final product. I do not expect to discuss about wine history, wine varieties or other things. Let's see how to taste a wine correctly.

Do you think you taste wine correctly? Well, what are the considerations in wine tasting? Flavour is an important component in tasting. Flavour comprises doors that we smell with our olfactory sense, basic tastes, which are not smelled by our nose, but tasted only by our taste buds and mouth-feel or oral sensations, such as hot, cold, rough or smooth, weighty or watery. Seeing, smelling, tasting, touching and sometimes hearing are the primary senses that we have. Hearing can be avoided in wine tasting, but some wine tasters use sense of hearing. So the basic four senses we use in wine tasting are seeing, smelling, tasting and touching. Therefore, the following are the considerable parameters in wine tasting.

- Clarity
- Colour
- Basic aromas (First sniff)
- Aromas (Second sniff)
- First Taste
- Second Taste
- Texture

SET UP FOR THE WINE TASTING

Adequate lighting	The best light is sunlight. But we can't use sunlight as we cannot sit out and taste our wine. Traditional incandescent light bulbs are pretty good.
Background	Background should be a white clear background with matt finish
Proper wine glass	ISO wine glass is perfect. Pour one ounce into a ten-ounce glass.
Water	To rinse the mouth. Don't use tap water, mineral water or chlorinated water.
Spit cup	To spit out everything you taste
Tasting note book/ tasting grid	To keep notes

- It is important to spit out the wine you taste. That's the difference between a wine tasting and others simply drinking wine for pleasure. It is important to do that so that you don't gradually succumb to the effect of the alcohol.

- It is important to pour 1 or 2 ounce in to an 8 to 11 ounce glass in tasting. If the glass is too big and the air space in the glass is too much, higher dilution can happen and smells could not be detected well. If the glass is too small wine can split when swirling.

- Keeping notes is also very important. Write notes about everything you get, smells, tastes and everything. Tasting grid will provide you hints.

CLARITY

Evaluating clarity of the wine is to see how well light is transmitted through the body of the liquid. Good source of light is important. Traditional incandescent light bulbs are pretty good. Florescent light is not suitable as it has high wave lengths.

To evaluate the clarity, tip the glass 45^0 angle from yourself above the white matt background and look down through the thick part of the liquid (core). Then look at the thinner part (Rim), the edge of the liquid. The terms clear, dull, Hazy/Cloudy, Bright, Brilliant can be used to describe the wine clarity. With the red wines if the background lights are not sufficient, use a small flash light and don't forget to keep notes.
If the light passes through the liquid without bumping, wine looks very clear. If you see something floating, it can be cork, if you see something submerged it can be grape particles remaining, bitartrate crystals, tartaric acid crystals, particles from the barrel or dead yeast/bacterial cells. The clarity of wine is lost with time.

COLOUR

Colour of the white wine can vary from watery to straw colour as watery, pale straw, medium straw and so on. In red wines colour can vary from brick red colour to a purplish red colour. Colour also can be evaluated as the wine clarity. Tip the glass 45^0 angle from yourself above the white matt background and look down through the liquid. The colour variation between rim and core is cold rim variation. If the rim looks more brown while the core looks more red like ruby red, it is an indication for wine is old. But it could be because of the wine fermantation in oak. So don't hurry to judge. Make notes.
Colour intensity has a direct relationship with the amount of the wine we use and the size of glass. 1 ounce wine in a 6-8 ounce glass is the best way to evaluate the wine colour.
If you see bubbles make notes as having CO_2 or simply has bubbles. In white wines look up from underneath to see bubbles.

SNIFF

After evaluating the clarity and the colour then sense the aromas of the wine. This can be done in two steps:
1st sniff – Swirl the wine, bring up to your nose and give it a quick couple of sniffs. This sniff is important to make sure that wine is okay. Not to identify specific aromas.
2nd sniff – Swirl the wine well and make a deep sniff. This sniff is to identify aromas of the wines.

Hundreds of aromas can be found from wines such as fruity smells, floral aromas, spicy, herby, mineral, earthy smells ,etc. Five to six aromas can be found in one wine if we sense

correctly.
Swirling before sniffs is very important. Agitation from the swirling helps wine to release its volatile aromas. Swirling can be done by holding the glass from the stem or by circling the glass on a tabletop. By covering the glass with the hand while swirling, you can trap the maximum aroma.

Swirling a wine glass

Circling a wine glass on table top

TASTE

This also can be done in two steps
1st sip – swirl the wine glass and take a quick sip. Swish it around and spit it out. Try to identify the basic taste. Basic tastes are sweet, sour, bitter, and salt. Usually wine does not taste salty. Try to understand the sweetness, sourness and the bitterness.
2nd sip – Swirl the wine and take a long sip. Swish around for long and spit it out. It is for identifying the retronasal aromatics of the wine and the finish of the wine. While wine is in the mouth, in the exhaling motion, aromatics that are in the wine are carried up to the olfactory bulb and brain tries to figure out what they are. Flavours such as fruity notes, buttery notes, wood notes, caramel notes can be identified in this second sip.

When identifying the finishing of the wine persistence of the flavour in the palate. If the flavour persists only for few seconds wine has a short finish. If a flavour persists for several minutes to a minute, it has a medium finish. If the flavour persists in the palate for longer than a minute, it has a long finish. However, this does not mean the quality of the wine.

TEXTURE / BODY

Texture consists the body, heft, weight, and the mouth feel of a wine. Texture can be identified by the wine in the mouth. Body of a wine means the thickness of a wine. It depends on the alcohol and the sugar present in the wine. If the alcohol percentage is lower, wine has a light body and if the alcohol is higher, wine has a medium or fuller body.

Mouthfeel means the sensations such as textural or kinaesthetic sensations based on things that are perceived by the nerves.

AS A SUMMARY, TASTING STEPS CAN BE GIVEN AS FOLLOWS,

1. Identify the clarity
2. Identify the colour
3. 1st sniff - Make sure wine is okay
4. 2nd sniff - Identify the aromas
5. 1st taste - Identify the basic tastes
6. 2nd taste - Identify the retronasal aromatics and the finish of the wine
7. Identify the texture/body

Pumpkin flour to save farmers

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The beginning of year 2020 is marked with an unexpected breakdown in economy due to the COVID-19 pandemic. It has caused massive alteration of the normal life of people. Farmers around the world lost their regular trade routines and the sources of income. The scenario of Sri Lanka did not differ much from other countries. Farmers were not able to sell their harvest for a considerable price. Between thousands of farmers, pumpkin farmers were highlighted. They did not have a chance to sell their harvest. They could be seen in long queues. The same scenario was observed during the last couple of years. With the advancement of new norms after COVID-19, people have started to consider about food scarcity, food safety and alternatives. They have started to see new solutions to face the all challenges. Pumpkin flour may be such an alternative which may help farmers to succeed.

Pumpkin is a common vegetable in Sri Lanka which is rich in vitamins and minerals. Pumpkin contains high amounts of beta-carotene, a precursor of vitamin A. Pumpkins are also rich in vitamin B, C, calcium, magnesium and iron. The level of carbohydrates and the calorific value are relatively low. Due to these reasons pumpkins are considered to have good health benefits. Pumpkins are considered to be good in preventing gastrointestinal cancers. Beta-carotene is considered to have antioxidant properties, by scavenging free radicals in the body.

This high profile of nutrients has given rise to many food applications in foreign countries. In these countries pumpkin is subject to some physical processes and pumpkin flour is made. This process includes, peeling, removing the seeds and strings, slicing, drying (the temperature and time combination can be adjusted according to the requirements), and grinding. If stored in an air tight container this flour can be kept for a several months.

This pumpkin flour can be used to make different food products such as cookies, bakery products and as a spice in some foods. In making pasta, to get the pumpkin flavor addition of flour is done.

Low moisture content in this flour is considered as an advantage when preparing bakery products. Not only that but also the fact that this flour is gluten free makes it suitable for diet products. In some occasions, replacement of wheat flour with pumpkin flour is done to some extent. Therefore this value added product has a good potential to penetrate in to the market.

Though many countries are using this product, In Sri Lanka, pumpkin flour is unknown to people. Introduction of pumpkin flour based products to the market can solve problems of the farmers. Every year a large wastage of pumpkin could be seen in the market. Prices go down during the season. Due to this reason farmers are reluctant to cultivate pumpkin. The government has to intervene in most cases to solve this. Therefore, rather than thinking about the selling the vegetable as it is, value addition could be a good opportunity to solve the issue.

Introduction of new product to a new market or the diversification is not an easy task. It may be time consuming. Introduction of these new solutions at the dawn of 'the new normal' will increase the ability of the people to accept it. There are also good opportunities to export to foreign countries. Dissemination of knowledge about these underutilized vegetables to farmers and small scale producers is a must. Proper technical and financial support must be provided to the small scale producers. A platform should be built to discuss their new ideas. Marketing sector can be easily managed because the product has many health benefits. Not only flour but also different other value added products can rescue farmers. Sri Lanka is a country rich in natural resources and wastage of these resources should be stopped. Alternatives should be found if the direct path for the destination is closed. It is a timely need of the country.

INDUSTRY 4.0: THE ERA OF SMART FOOD MANUFACTURING

Rapid evolvement of the food industry now in concern of transforming into a fully automated new digital era.....

Busy lifestyles of consumers and their increasing awareness on the quality and safety of foods have greatly impacted the consumer preference and purchasing behavior. There is a high demand of wide variety of items which are produced in a short time with the required quality and hence the competition between companies is also rapidly increasing with the adoption of state-of-the-art technologies.

The term "Industry 4.0" which stands for the fourth industrial revolution, is becoming used to frame automation, digitalization and data exchanges in the manufacturing technologies. The embracement of Industry 4.0 in the food and beverage sector is currently happening as mass production lines with high technological processing systems are being adapted and industry is always seeking for faster and efficient ways of food processing with the ultimate aim of fulfilling the consumer expectations.

There are nine technological drivers known as the nine pillars of Industry 4.0: big data and analytics, autonomous robots, simulation, horizontal and vertical integration, cybersecurity, the Industrial Internet of Things (IIoT), the cloud, augmented reality and additive manufacturing. Many kinds of sensors, machines and IT systems are linked to create collaborative systems to get real time responses.

These connected systems are known as cyber-physical systems (CPS) and interact using Internet-based protocols to establish an intelligent manufacturing concept called "Smart Factory" which is presented through combination of cyber-physical systems (CPS), Internet of Things (IoT) and cloud computing. Merging of food industry with digital technologies such as advanced robotics, artificial intelligence and sensors, 3D printers, software and other advanced models is the core idea of a 'Smart Factory' to get the ability to connect production lines and analyze with a fully automated system with minimal human involvement. Industrial robots with high-tech image processing systems are a major component of a 'Smart Factory'. Those are able to define parameters very clearly and identify different food products in a processing line while performing several other tasks in seconds.

Digitalized food traceability systems are also an important part of smart food manufacturing hence monitoring food processing and distribution lines through the complete chain from the farm, and processing factory, to the retailer with humans is much challenging. Quick Response (QR) code and Radio Frequency Identification (RFID) are some examples of technologies adapted for the identification and tracking of food materials in food chains where consumers can also access data about the product.

Industry 4.0 is actually about smart manufacturing and the opportunities and advantages are sometimes broader. This concept combines automation with IT networks and systems respond in real time to meet requirements of the customer and conditions in the food factory. Therefore the factory operations can be done more efficiently and effectively. Factories' bottlenecks can be easily identified and they can be overcome in an effective manner. Food and beverage manufacturer can meet current demands easily while making more informed and better decisions. A factory can increase its productivity by producing more from less (better use of resources). Waste generation is also reduced. With thanks to the automation, cost of the production is significantly reduced. Labour cost is reduced owing to the self-driving vehicles and delivery process is expedited. In addition to these opportunities, Industry 4.0 provides an opportunity to the food factory to improve the food safety by ensuring a greater traceability and facilitates to manage complex and competitive global supply chains through robotics and IT. Quality of the entire production process is improved due to the greater degree of automation.

Other than that for the food business, there are opportunities for the people also. Industry 4.0 allows access to the consumers to verify their food before they consume the food. Consumer can get to know the origin of the food and the entire supply chain of the food. This concept makes people's jobs easier and creates new jobs through enhancing the skills.

There are some challenges to be overcome. Undoubtedly, applying of novel automation and robotic technologies to food industry demands a high initial cost. Therefore the possibility of allocating such additional cost to the end product is not applicable. On the other hand, automation degrades and abuses natural resources such as soil, water and genetic diversity. The technologies linked to Industry 4.0 depend on non-renewable resources, such as oil and the incorporation of the cleaner technologies is a critical requirement. Thus, a correct integration of ecological and social dimensions at operational level is required to sustain the 'Smart Factory' concept.

Words by Chathudina J. Liyanage, Shammi Hettiarachchi, Narmada Weerakkody

Common Milk Adulteration

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Food adulteration is one of the major global concerns facing today's society and developing countries are at higher risk associated with it due to lack of monitoring and policies. Food adulteration can be defined as the practices of adulterating food or contamination of food materials by adding few substances which are collectively called the adulterants. Those are the materials or commodities of low quality which are applied for economic and technological benefits to food items by manufacturures. Adding these adulterants reduces the nutrient value in the food and the food becomes unfit for consumption.

Milk is almost an ideal meal. Its nutritional value is high. It provides protein for body building, bone formation minerals, vitamins and energy etc. Unfortunately, worldwide, milk is being adulterated very easily.

Milk and dairy product adulteration came into global concern after breakthrough of melamine contamination in Chinese infant milk products in 2008. Milk is adulterated either intentionally or accidentally during production and processing of milk. There are some adulterants that are very harmful to the health and some adulterants do not pose serious health risks. Adulterants like vegetable protein, milk from different species, soap, acid, starch, table sugar and chemicals may be added to the milk. The major adulterants in milk having serious adverse health effect are urea, formalin, detergents, ammonium sulphate, boric acid, caustic soda, benzoic acid, salicylic acid, hydrogen peroxide, sugars and melamine.

The oldest method of milk adulteration is the addition of variable volumes of water to increase its extent artificially for extra profit. Therefore the nutritional quality of milk is decreased and if the water is contaminated, there is a risk to human health due to waterborne diseases.

Starch and table sugar are added to increase the carbohydrate content of the milk and thus the density of milk will be increased due to solid non- fat (SNF) content and it makes the milk thicker. Generally, it increases the lactometer reading of milk, which was already diluted with water. In addition to starch, wheat flour, and rice flour are also added.

Melamine is an organic chemical most commonly found in the form of white crystals and it is rich in nitrogen. The protein content is a key parameter that measures the quality of milk product and it is usually determined by calculating nitrogen content; however, no approach can differentiate non-protein nitrogen from naturally occurring nitrogen in protein. This detectability gap allowed for falsification of the protein content in food by adding nitrogen-rich chemicals, such as melamine. Melamine adulteration causes not only protein deficiency, but also kidney stones and renal failure when it reacts with cyanuric acid inside the body.

As a result, in China, more than 50,000 infants have been hospitalized and 6 infants of them died because of high level of melamine in their food.

Salicylic acid, Benzoic acid and Hydrogen peroxide are added as preservatives to increase the shelf life of milk. These chemicals cause asthma and increase level of hyperacidity. Formalin is also added to preserve milk for a long period of time. But formalin can cause liver and kidney damage, because of its high toxicity. When taken in high doses it can cause cancer and may lead to coma.

Urea is the common milk adulterant to increase the shelf- life , preparation of synthetic milk to raise the SNF value and increase non-protein nitrogen content. It also adds viscosity to milk thereby giving a feeling of thick milk. It is harmful to heart, liver and especially for kidneys as the kidneys have to do more work to remove urea from the body.

Different concentrations of hydrogen peroxide is added to milk as preservative and increase the shelf life of milk from activating lacto peroxidase system, which destroys the bacterial population by its antibacterial effect. It is used to minimize the processing cost by heating the milk. These additions may cause to serious health-related problems such as kidney failure.
Ammonium sulphate is added to the milk to increases the lactometer reading by maintaining the density of diluted milk.

Soap and detergents are added to milk to increase the foaming of milk, to emulsify and to dissolve the oil in water giving a frothy solution, which are the desired characteristics of milk. Addition of such chemicals cause health problems related to stomach and kidneys.

Vegetable oil is also used as a milk adulterant. Because of milk fat is very expensive. Therefore vegetable oil is replaced with milk by extracting valuable components of natural fat present in milk. Vegetable fat is unsaturated and it gets oxidized and becomes rancid when exposed to air and becomes hepato-toxic and may cause liver cirrhosis.

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Food colour coding for Sugar, Salt and Fat Regulation in Sri Lanka

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Food colour coding for Sugar, Salt, and Fat regulation 2019 was enacted by gazette No 21/9/3 dated 17 April 2019.
It was expected to implement from 1st June 2019, extended to 30th June 2020 and again extended to 31st Dec 2020.
This regulation has been enacted as a measure for reducing non-communicable diseases. Rules are imposed on,

- Semi-solid and solid foods after manufacturing
- Packaged products (not for loose products)
- Foods which are imported and packaged in Sri Lanka.

Rules are not applicable on,

- Primary agricultural products – cereals, pulses, vegetables, roots, tubers, salt, sugar, meat, fish
- Spices, condiments, curry mix, flavoury mix in packaging
- Functional foods (foods for special dietary use) to be recommended by medical supervision
- Loose packaging e.g. buying 100g of loose biscuits (Food that is weighed, counted or measured in the presence of the purchaser)
- Bulk packaging used in shipping, where relevant retail pack has labelling
- Infant formula, export only foods
- Solid and semi solid food that are convert to liquid once prepared or reconstituted for consumption
- Energy drinks
- Nonfat milk powder, concentrated orange (RTS beverages)
- Food manufactured before the effective date of regulations

These Colours should be visualized as follows:

- Each parameter to be displayed in a box of 2cm in height, 1cm in width
- Each parameter e.g. salt to be stated in three languages (min height 2 mm) and each content displayed in figure (min height 1.5 mm)
- These labels to be displayed in main panel or packaging in close proximity
- If the labels take/cover more than 25% of main panel, then the labels can be displayed on a dispenser panel

DEFINITIONS

- Fat: total of fatty acids
- Salt: total sodium chloride content
- Sugar: Total of monosaccharide (glucose, fructose, galactose) and disaccharide (sucrose, maltose, lactose, trehalose, lactulose)
- Therefore colour code expected on “sugar” is not only for sucrose

IMPLEMENTATION GAPS

- Relevant products not following the regulation (majority of imported packaged foods)
- Not relevant to imported products like fresh milk, fried chips, tomato ketchups, corn flakes, creamy peanut butter, vegetable lasagna, cheesy and chilli cashew, pickle, potato flavored papadam, prawn soya
- Not relevant for raspberry jelly, marshmallows, honey cashew, jujubes, vanilla rollo swiss cake, bulto toffee
- Apparently incorrect values labelled on packaging – this will mislead consumers, and unfairly compare with competitors. Two examples are given below.

Corn flakes

Corn flakes

Sugar

0 g / 100 g

→

Ingredients:

Corn Grits (91%), Iodized salt, malt extract, Sugar, Soya lecithin INS 322

Antioxidants INS 320

Carbohydrate – 84 g

According to research evidences flakes contain
Normal – 7g/ 100g (Green)
Flakes with fruits or Nuts – 16g/100g (Amber)

Chocolate ice cream

Brand 1
Sugar – 10g (Green)
Salt – 0.05g
Fat – 5g/100g

Brand 2
Sugar – 24g (Red)
Salt – 0g
Fat – 7.9g

- Compliance to this colour coding regulation would be expected by January 2021, requiring industries to make arrangements to comply
- In turn it would help better consumer awareness and truthful labelling

The origin and development of the subject area of food science and technology in Sri Lanka's higher education sector

Professor Arthur Bamunuarachchi is Professor Emeritus at the University of Sri Jayewardenepura (USJP). He was the founder and former Head, Department of Food science and Technology, USJP and he also served as the Head, Department of Chemistry, USJP. He was the founder director of Buttala Affiliated University College (BAUC) of the USJP and founder chairman of the Institute of Post Harvest Technology (IPHT), Sri Lanka. He is an eminent personality who is much loved and respected by academia, industry professionals and students in the field of Food Science and Technology in Sri Lanka for his longstanding contributions to the advancement of the discipline. A devoted teacher as well as a prolific researcher, he shares his views on the development of Food Science and Technology as a subject area in the higher education sector of Sri Lanka.

Emeritus Professor
Arthur Bamunuarachchi

What do you recognize as the major historical milestones in the development of the discipline of food science and technology in the Sri Lankan university system and who were the key figures involved?

I am indeed glad to be asked by the editors of the 'FoodTech insights' magazine to provide some thoughts for the inaugural issue. This activity of establishing a degree programme in Food Science and Technology in fact spanned through about 27 to 28 years to really solidify and formally approved to be offered at Buttala Affiliated University College (BAUC), then affiliated to the University of Sri Jayewardenepura.

It was Late Prof. Arthur. C.J. Weerakone, the then Professor of the Biological Sciences Department, Vidyodaya University (presently the University of Sri Jayewardenepura), who conceived the idea of starting a University Level Food Technology Program as far back as 1968. He was not a food Scientist nor a Food Technologist, but he fore-saw the need, and obtained the assistance of late Mr. L.A.C Alles, the only knowledgeable food specialist at that time in the country, who was in charge of the Canning Factory of the Marketing Department, late Dr. Nihal.N.de Silva, a Food Microbiologist of the then Fisheries Research Station (presently NARA) and Dr. Senthe Shanmuganathan, the then Biochemist of the Medical research Institute (MRI) to carve out a course content suitable for a Post Graduate diploma in Food Science and Technology. The task was well supported by Prof. G.C.N.Jayesuriya, the then Dean of the Faculty of Science, who was responsible for obtaining needed clearance amid obstruction from the higher education management system of that era. The first program was offered in 1968/69, which was a twelve month program, enrolling 12 students at a fee of Rs.1500/= supported by experts such as Dr. R.O.B. Wijesekera (CISIR), Mr. K.C. Kularatne (Ceylon Cold Stores), Ms. R.Withrane, Coconut Board and several others from the state and the private sector.

On my return to SL in 1970 after completing my postgraduate studies, I was recruited to the

Department of Chemistry of USJP and during the same period the management of the Post Graduate Diploma was transferred to the Department of Chemistry and I was appointed as the Coordinator of the program. During my absence from 1974 to 1979 on a Ph.D. stint, Prof. Tuly de Silva, who was Dean of the Faculty of Applied Science was the coordinator of the program. On my return with a Ph.D from UNSW, Australia in 1978,I was again asked to manage the Post graduate Diploma. With much more experience, and overseas expert contacts, I did propose the establishment of a center for training and research in Food science and technology at USJP, and from 1979 to 1985, this proposal was not supported by the higher authorities.

In 1983, Prof. Tuly de Silva and myself were able to interact with Lund University, Sweden, and obtain Interactive assistance with Prof. Kåre Larsson, the then Head of the Food Technology, group there. Prof Larsson was supportive of the food center proposal at USJP, and so was Prof. Rune Liminga, Director, Chemical center, University of Upsala Sweden, who were willing to fund. Backed by the then vice chancellor of USJP Dr. Karunasena Kodithuwakku, we set about upgrading the post graduate diploma to a master's degree status. With the support from Prof. Larsson, a good master's degree course content was developed, acceptable to the IFT (Institute of Food Technologists-USA) criteria and USJP executed it with great success. This program was self-funded and commenced in the early nineties with 20 students enrolled to start with a fee of Re. 20,000/= or so, and with the participation of about 35 visiting staff members, offering their expertise.

The affiliated University system appeared on the scene in the late eighties and the then Government headed by late H.E President R. Premadasa wished one affiliated university College established to offer courses in Food Technology. USJP was asked to plan and execute same, and so it was done at Buttala Gam Udawa site, a well-planned two-year diploma approved by the USJP faculty was offered commencing in 1992. The program recruited senior staff members like Dr. K.K.D.S Ranaweera and instructor staff like Mr. M.A.J.Wansapala, Ms. Indira Wickramasinghe and Mrs. K.M. Somawathie and a few others including visiting staff from the region.

At this juncture, the University grant commission wished all affiliated University colleges to be converted to Applied Sciences faculties and this suggestion made us to plan suitable courses in the Applied Sciences, where we planned degree courses covering relevant areas based on chemical and physical sciences being taught at that time. Subsequent to this era, BAUC was to become a Campus of the Sabaragamuwa university of Sri Lanka from 1996.

Upon my return to the USJP, I again put forward the proposal for the establishment of the Department of Food Science and Technology in the year 2000. However, the Department was granted to USJP in 2005, after 37 years of initiating the food technology activity. By this time Peradeniya University and SUSL, both had been granted food science and technology departments.

What is your opinion about the current situation in the university system regarding the discipline of food science and technology and what are the future prospects?

It is interesting to note that while the above activities were going on at USJP and SUSL, the authorities have appreciated the importance of this subject area and now there are many more Universities offering the subject at present. More recently, even in the newly established engineering technology faculties in several Universities. I note that these faculties are offering Bio Systems Technology as well as Bioprocess Engineering/Technology programs with a major focus on food science and technology.

However, these programs should be well supported by manufacturing technology related

laboratories (Pilot scale processing facilities) for hands on training of the undergraduates. It is also essential to go in for collaboration in possible fields with overseas Universities and research stations to get the programs to international recognition and seek staff training at leading centers in the field. The management of the University, the UGC and the government must be aware of this need and provide for acquisition of relevant pilot plant equipment. These are lacking in all food science and technology departments of our Universities at present.

How would you describe the evolution of research in areas related to food science in the Sri Lankan universities, particularly at USJP?

Research in the fields related to areas of Food science and technology commenced at USJP much before the Food science and Technology Department was established. In fact, the first masters by research degree commenced in 1970, and was on an investigation into the characteristics of yeasts in Sri Lankan toddy. The second was a Ph.D. enrolment of Mr. A.L. Jayewardene, a junior researcher at the CISIR (presently ITI), who worked on characterizing Sri Lankan essential oils. In fact, these projects paved the way for University and Institute interactions. On initiating the master's degree program at USJP, students were required to carry out a guided research project. Some of the projects were for the Industry or the Institute from where the student came from. Supervisors were specialized visiting staff from the M.Sc. academic team. These arrangements were quite fruitful for the industry and the Institutes as these individual students handled problems of concern to these organization, and thus brought in very close interactions of the Food Technology activity with institutes.

The research projects leading to MPhil or PhD were mutually agreed food research areas and were supervised by experts both from the Chemistry Department and the respective Institute. The MSc related research projects include areas such as food related Chemistry, Biochemistry, Microbiology, Food Post harvest Management, Nutrition, process and product development, food habits, food related management and marketing etc.

All in all, the food science and technology activity at USJP from the earlier days has played the role as platform for the industry and the research institutes to develop their knowledge base, often enabling the individual recruits the program to obtain a post graduate degree, and make them entitled for due promotions, without waiting for overseas training.

What kind of expansions and enrichments do you wish to have in the discipline of food science and technology in Sri Lanka n future?

I think it would be of great interest to the academic and research development by expanding further into areas such as food microbiology, food chemistry, food engineering, product technology nutrition etc, and offering specialized degrees in these areas, and plan to stand on its own supported to a good a extent by the commercial food sector in the country and also overseas centers. research and funding agencies. Further, Universities offering food science related degree programmes should also launch extension programs to the rural sector and transfer the available and newly found technological know-how in the food technology related fields. It should then be in good footing to expand the academic programmes and research.

Compiled by: Chathudina J. Liyanage

B.A.A. Oshadhi Peiris | Faculty of Technology | Sabaragamuwa University of Sri Lanka

ABOUT GM FOODS

Genetically modified (GM) or genetically engineered food is any organism whose genetic material has been altered using genetic engineering techniques. Alterations in the genetic makeup of animals and plants is carried out to get a good quality of yield and to make profit. Some famous GM foods are golden rice, tomatoes, corn, soybeans, wheat, potato, and papaya. Rubber and cotton are not consumed as foods but they are genetically modified. The history of genetically modified organisms goes back to 1900's. The discovery of DNA and the development of genetic engineering in the 1970s gave an impulse to genetic modification in food. In 1987, first outdoor field inspection was conducted as an experiment. In 1994, Calgene, a Californian company launched the first genetically modified commercial food called "Flavr Savr" through the genetic modification process, to slow down ripping speed and prevent tomatoes softening. In 2000 golden rice was introduced with a modified nutrient content. Most people initially accepted GM foods because they were better in nutrient content and testier than normal foods.GM foods require less fertilizer and less pesticides because the genes control against pests and other requirements. Therefore, these plants are disease and drought-tolerant, and fast-growing plants. but scientists also believe GM food cause human health issues (i.e.allergens, cancers) and the main harmful impact is the loss of biodiversity in the environment, extinction of the traditional varieties, reducing natural selection and other adverse effects on the natural environment.

In some countries GM foods are already allowed in the marke but Sri Lanka banned the import of GM foods in 2001. Also, Sri Lanka is committed to execute biosafety for the biodiversity use of GM organisms, according to the international agreement on biosafety called "Cartagena protocol". Main purpose of the Cartagena is to ensure acceptable security for handling, use and transfer of GMOs. Countries around the world are required to label GM foods because of the likes and dislikes of different people. It is the main purpose of GM food labeling. By labeling, consumers can consume genetically processed foods according to their needs and their will. Internationally GM foods labeling is a complicated process. In some countries labeling is mandatory and some countries it is not. In developing countries, it is not practiced at all. According to the Codex Alimentarius commission, the government has to make its own decision about GM food labeling and the policies of labeling varies from country to country or region to region. This is declared by the Codex commission after considering all countries. Finally, genetical modification can result in increase yields and it has the potential to reduce global hunger and malnutrition rates. It may also helps to save and conserve the environment by decreasing using the pesticides, fertilizer, and chemicals. No matter what, it is important that we proceed with carefulness to avoid adverse effects on our environment and our health. This is because with the advancement of technology, genetic modification has also gained a strong place.

Scientific Explanation on Fresh - Cut Processing Technology

R. Chathura Prasad | Export Agriculture Degree programme (Food processing Technology) | Uva wellassa University

STEPS OF FRESH CUT PROCESS

- Harvesting
- Receiving
- Pre-cooling
- Washing and disinfection
- Peeling, trimming, descending and cutting into cpecific sizes
- sorting for defects and dipping using anti-microbial agent, anti-browning agent and texture-preserving agent
- Drying
- Packaging and labelling
- Storage and distribution

QUALITY FACTORS OF FRESH-CUT FRUITS AND VEGETABLES

1. Visual appearance (freshness, colour, defects, and decaying)
2. Texture (crispness, turgidity, juiciness, firmness, toughness, and tissue integrity)
3. Flavor (taste, smell)
4. Nutritional value (vitamin A and C, minerals, dietary fiber)
5. Safety (absence of chemical residues and microbial contamination)

HOW TO MAINTAIN QUALITY & SAFETY?

RAW MATERIAL QUALITY

- Is an important factor
- Only the best quality produce is selected for the fresh-cut processing
- Cannot utilize inferior quality, over mature or defective commodity that cannot be marketed intact

FACTORS TO BE CONSIDERED BEFORE HARVEST

- Pre-harvest management (genetic, climatic, cultural practices)
- Maturity level and method of harvest
- Handling between harvest and preparation

PHYSIOLOGICAL EFFECTS OF FRESH-CUT PROCESSING

Wounding of the fruit tissue by cutting

- Increase in respiration rate, loss of water, food reserves
- Alteration of ethylene production rates
- Increase in other biochemical reactions
  - Discoloration or colour changes
  - Texture
  - Aroma & flavor
  - Nutritional quality

At the same time, microbial growth at the cut surface increases as sugars become available, thus accelerating the opportunity for microbial spoilage

BIOCHEMICAL CHANGES IN FRESH-CUT PROCESSING

Colour

- Browning or surface darkening – result of oxidation of phenolic substrates present in the produce by PPO enzymes
- Yellowing of green vegetables. e.g. broccoli and spinach
- Dehydration of surface debris on cut and peeled carrots results in a translucent appearance - “White blush”

Flavor

- Sweetness, acidity, astringency and bitterness
- Many flavor and aroma components are lost in

fresh-cut fruits through enzymatic reactions
- Microbial spoilage also contributes to flavor degradation in fresh-cut products

Texture quality Changes

- The unprotected cut surface of fresh-cut fruit losses moisture at an extremely rapid rate
- Results in rapid wilting and shriveling of fresh-cut produce and thus a loss of the crisp, firm texture of the product

Nutritional quality changes

- Loss of vitamins and minerals
- Loss of other bio-active compounds

QUALITY LOSS DUE TO MICROBIAL CONTAMINATION

- Fresh-cut vegetables harbor lower numbers of micro-organisms than unwashed whole vegetables, as a result of washing in chlorinated water
- However, slicing, dicing, and shredding procedures, as well as temperature abuse during storage can result in increases in mesophilic aerobic microbe populations.
- Spoilage organisms associated with fresh-cuts;
    1. *Pseudomonas spp*.
    2. Lactic acid bacteria
    3. Yeasts and molds
    4. Pathogenic bacteria

- Application of GAP (Good Agricultural Practices), GMP (Good Manufacturing Practices), HACCP (Hazard Analysis Critical Control Point), ISO 22000
    - *Listeria monocytogenes*
    - *Salmonella*
    - *Clostridium botulinum*
    - *Shigella spp.*
    - *Escherichia coli*

QUALITY EVALUATION OF FRESH-CUT PRODUCTS

- Firmness, as composition analysis, colour, sensory testing, microbiological investigations, total plate count, yeastand mould count, *E. coli* and Coliforms.

MAXIMIZING QUALITY AND ASSURING SAFETY DURING FRESH-CUT PROCESSING OPERATIONS

1. Use of the Sharpest cutting tools

    - Dull utensils cause excessive cell damage and bruising leading to poor quality
    - Use of sharp, stainless steel cutting tools
    - Frequent sharpening of machines and hand knives
    - Proper cleaning and sanitizing of processing equipment and surfaces that come in contact with fresh-cuts is clearly a key control point in fresh-cut fruit processing
    - Machinery for defined purposes. e.g. carrot cutter
    - Machinery for large scale production

2. Minimizing transfer of contaminants during washing

    - Best quality water should be used for the final rinse of intact fruits and vegetables prior to fresh-cut processing
    - Measurement and recording of the chlorine level and the pH (4.5-5.5) of wash water is a critical element of any quality assurance programme- use only food grade chlorine
    - If ice is used to maintain the temperature, be careful about the quantity of ice.
    - Washing can be manual washing/mechanical washing, water quality is important, running water is more suitable

3. Temperature management during processing operations

- Temperature control is essential at each step of a fresh-cut fruit process, in the distribution chain and in retail
    - To slow the respiration rate
    - To maintain quality and prolong shelf life
    - To slow the growth of moulds and bacteria
- Temperature management is the most important factor in the preservation of fresh-cut fruit quality

4. Pre – treatment / Post cutting treatments

- To reduce discoloration and browning [take necessary legal actions on unpermitted chemicals added to young jackfruit (polos) and breadfruit: It was recently detected adding toilet cleaners as anti- browning chemicals by fresh-cut produce sellers in kandy area]

POST CUTTING TREATMENTS DESIGNED TO EXTEND THE SHELF LIFE OF FRESH -CUT PRODUCTS

1. Chemical pre-treatments – Control of discoloration or browning

    - Acidification: Acetic, Ascorbic, Citric acid
    - Application of edible coatings
    - Application of natural anti- microbials: Ginger, Cinnamon Extracts, chitosan
    - Firming agents: Calcium
      (GRAS – Generally recognized as safe compounds – FDA/ USDA database)

2. Physical pre-treatments

    - Reduce levels of oxygen by vacuum, modified atmospheric packaging (MAP) or gas flushing may reduce cut surface discoloration
    - MAP – Consisting of low oxygen and high carbon dioxide concentrations are used to reduce respiration rates and ethylene production
    - Packed in film bags or plastic containers over wrapped with film after heat treatment (blanching)

DISPLAY OF FRESH-CUT FRUITS

- Display fresh cut fruits at 4^0 C or below
- Discard cut fruits kept at ambient temperature for more than two hours
- Inspect packaged cut fruits on a regular basis for damage or spoilages
- Any poor quality fruits should be disposed of immediately
- Fresh- Cut produce on market Display
    - Products display on ice
    - Products display on refrigerated shelves

SIGNS OF DETERIORATION OF FRESH-CUT PRODUCE

1. Bruised or broken pieces resulting from packing too tightly or rough handling
2. Wilting, wrinkling, shriveling, and excessive drying due to water loss
3. Mushiness resulting from excessive tissue softening
4. Development of off – colors due to loss of chlorophyll and enzymatic browning
5. Presence of free liquid within the packages (due to decay causing pathogens)
6. Presence of undesirable odors
    - Fermented Aroma: Ethanol / Acetaldehyde
    - Foul Smell: Bacteria
    - Mouldy Smell: Fungi
7. Bloted bags due to excess gas in sealed bags resulting from fermenting or decaying product

METHODS TO MINIMIZE THE DETERIORATION OF FRESH-CUT PRODUCE

1. Use highest quality raw materials
2. Minimize mechanical damage; use sharp knives
3. Rinse cut surfaces; remove excess water
4. Maintain strict sanitation: Chlorinated water
5. Use appropriate package and atmosphere
6. Maintain product temperature (Cold-Chain)

Kalu Ala Kola Curry

Compiled by W.A.P.Kumara & K.P.H.M. Bandara | Department of Food Science & Technology | Sabaragamuwa University of Sri Lanka

Scientific name: *Colocasia esculenta* (L) *schott*

Wel ala kola curry is a very famous food dish in Kegalle, Sabragamuwa province, Sri Lanka. The plant grows in marshy lands and wet muddy soil. The leaves of this plant are very similar to *Habarala* leaves. It can grow upto 1.5-2 feet. The leaves contain vitamin C, vitamin B_6,vitamin E, manganese, potassium, copper, phosphorus and Iron. Leaves are also rich in phyto-chemicals such as flavonoids and triterpenoids. The leaves generally itchy. Traditionally, women don't cook it immediately after plucking, they keep it at least one day to dry. Traditionally , this plant is considered a very healthy medicinal plant. It is known to have different pharmological properties; leaves are good for immunity boosting, neuropharmological activity, anticancer, anti-diabetic, antioxidant, anti-inflammatory, hepatoprotective, hypolipiddemic, anti-melanogenic , estrogenic activity.

INGREDIENTS

A bunch of wilted wel ala kola leaves (2-3 days after harvesting)	
Chili powder	2-3 tea spoons
Turmeric powder	A pinch
Curry powder	1 tea spoon
Salt	2 tea spoons
Red onions	7-8 bulbs
Curry leaves, pandan leaves	as required
Garcinia	2 pieces
Maldive fish	2 tea spoons
Garlic	4-5 cloves
Half a lime	
Mustard seeds	1 tea spoon
Chili flakes (large)	2 tea spoons
Coconut oil	2-3 table spoons
Coconut milk (first squeeze)	250 ml
Coconut milk (second squeeze)	250ml

PROCEDURE:

First, wash and clean the wilted leaves. After removing the moisture, cut them into pieces of ½ inch.

Add turmeric powder, chili powder, curry powder, salt, maldive fish, a portion of finely sliced red onion, chopped garlic, curry leaves, pandan leaves and garcinia to an earthen pot and pour the coconut milk (second squeeze). Place it on a hearth. Add the chopped wel ala kola leaves in to the gravy when it boils. Then add some lime juice to the mixture and mix carefully. Pour the coconut milk (first squeeze) after the gravy has boiled. Keep under low flame for 10-15 minutes.

Take a pan and place it on the hearth. Add the coconut oil. After heating the oil, add mustard seeds, chili flakes and the remaining portion of sliced red onion and continue frying. Finally, add the gravy on the frying mixture and mix well.

Serving size: 4

Role of traditional beverages in "New Normal Sri Lanka"

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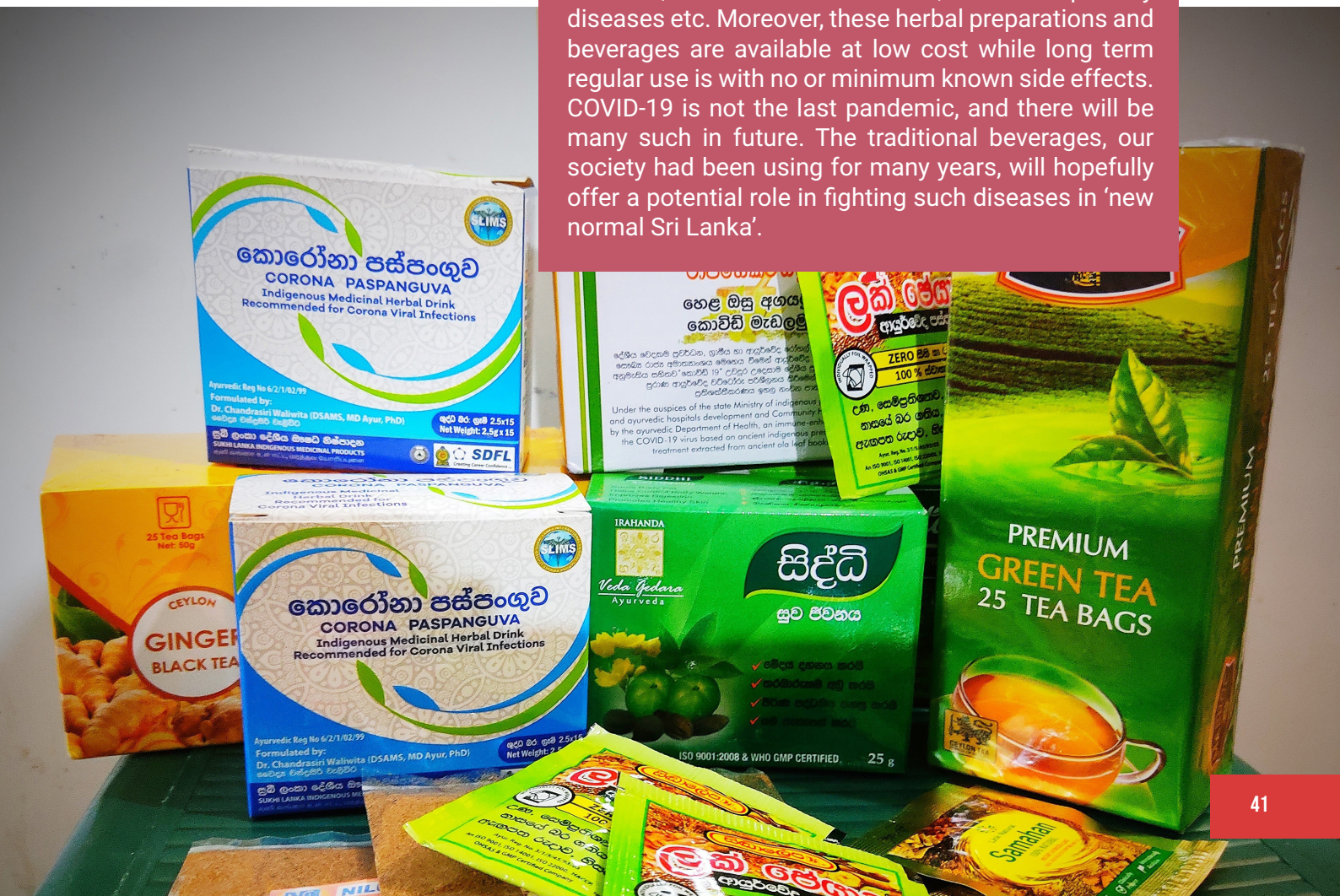
At the dawn of 2021, the common saying we heard was that "Things may never go back to normal, so you may create a new normal". When we reflect on the recent past and look forward to the near future, it seems been not uncommon for people all over the world, since all have been suffering from similar problems with the rise of the COVID-19 pandemic. The lifestyles had changed drastically and some changes seem irreversible. Food and beverage play a key role as one of the prime needs of human. Aglobal trend has been built towards traditional food habits in the recent past, while a similar trend of massive use of traditional herbal beverages had been observed even in Sri Lanka since the begin of this pandemic. Tea, King Coconut water, fruit juices, and a variety of herbal drinks represent our traditional beverages. The use of tea, coriander (*Coriandrum sativum*), heenraththa (*Alpinia calcarata*), and other natural herbs along with condiments had created wide discussions among the general public as well as the scientific community amidst this pandemic scenario. Enhancing the immunity of individuals is not been the only challenge in 'New normal' but also overcoming the indirect consequences such as obesity and prevention of non-communicable diseases stand as other well-known challenges. Besides their primary use as thirst-quenchers, the traditional beverages may offers other potential benefits in addressing some of the "New normal" challenges in Sri Lankan context.

'Boosting immunity' comes as the best answer for the question of 'How to minimize the risk of infections?'. Some of the beverages commonly used in traditional societies, have shown the ancient wisdom to strengthen the immunity. Ceylon black tea, coriander, and vitamin C rich fruit juices are the first on the list. It is suggested that the practice of drinking black tea may also contributes in lowering the Covid incidences in the country. According to a recent study of Tea Research Institute, Sri Lanka, 'theaflavin', an antioxidant polyphenol in black tea, could potentially inhibit critical SARS-CoV- 2 enzymes, and thereby, theoretically having potential of fight against COVID-19. Theaflavins are produced during the fermentation process of black tea manufacturing which gives its dark colour, and the amount is very high than that of its famous unfermented counterpart, green tea. The research also indicates that this flavanol relaxes and opens air passages in the lungs making it easier to breathe thereby alleviate respiratory diseases such as asthma, chronic bronchitis, and other lung diseases. Similarly, coriander, a herb rich in antioxidants has proven anti-viral effects. Any such activities of fruit juices containing

vitamin C such as lime and oranges had been traditionally increased by adding ginger and bee honey. According to the Ayurvedic Medicinal system, traditional beverages are always prepared by adding garlic, ginger, turmeric, and coriander like herbs which are rich in antioxidants and beneficially fight against infections while also offering the required organoleptic properties as beverages. Thus, such beverages will offer multiple benefits in boosting immunity at the face of a pandemic.

"Stay safe, Stay home" slogan is another one of the most heard with the rise of COVID-19 pandemic. However, 'stay home' has given rise to problems such as lack of exercises, high-calorie intakes, and mental stress, directing towards development of even the problems associated with obesity. The traditional beverages are normally characterized with low-calorie amounts. Catechins present in tea helps to improve the metabolism and caffeine increases the energy use. Some studies have shown that the tea polyphenols might block fat from being absorbed in the intestine. Not only tea but also other traditional beverages contain similar compounds which may have potential in losing weight, increasing metabolism and further, relaxing mind. Hence, consuming traditional beverages regularly with diet together with proper exercises will contribute to maintain a healthy body and mind, even when staying home.

The health issues related to non-communicable diseases had been given a high priority in public health care even before the pandemic started and also has been recognized as a major contributor in COVID-19 mortality. There are many researches which have proven the activities of identified compounds related to traditional herbal drinks used in Sri Lanka, against diabetes, cardiovascular diseases, chronic respiratory diseases etc. Moreover, these herbal preparations and beverages are available at low cost while long term regular use is with no or minimum known side effects. COVID-19 is not the last pandemic, and there will be many such in future. The traditional beverages, our society had been using for many years, will hopefully offer a potential role in fighting such diseases in 'new normal Sri Lanka'.



Value Added Sea Weed-Based Foods

B. G. D. Ojithma Perera | Aquatic Resources Technology Degree Programme | Uva Wellassa University of Sri Lanka

Sea weed are amazing in every form of dish. They will make you happy similar to other foods no matter what. Edible sea weeds can be used in the preparation of many food products. There are several edible groups such as red algae, brown algae and green algae.

COLOR DOESN'T MATTER, THEY COLOUR YOUR TASTE..

Seaweed has been part of traditional cuisine in China, Korea, Japan, Australia, New Zealand and Western Norway. However, It is not a very popular food in Sri Lanka. Seaweed cultivation for food use is being practiced to limited extent in Sri Lanka. Sea weeds are a good source of vitamins, minerals, salt, antioxidants, fiber and polysaccharides. *Ulva lactuca, Caulerpa racemosa, Gracilaria spp, Sargassum spp.* and *Kappaphycus alvarezii* are cultivated in Sri Lanka currently.

FOOD PRODUCTS/DISHES

As a raw salad, pickled seaweed, extra nutrient for noodles and pasta like foods, alternative to lettuce, as cookies, soup, cordial, snack, jelly and sweets.
Sea grapes (*Caulerpa racemosa*) are usually eaten raw with vinegar as a snack or in a salad. Seaweed oil is also used for food preparations. It is a good source of essential fatty acids. It contains mono and polyunsaturated fats, in particular EPA and DHA, which are Omega-3 fatty acids. Roasted sheets of nori (*Pyropia spp.*) are used to wrap sushi.
Gracilaria spp. provide agar-agar, a common gelling agent. *Kappaphycus alverizii* is used for ice cream products, bakery products, in jelly as a thickening agent. It is a good source of carageenan.

MOST POPULAR EDIBLE SEAWEEDS

Green algae- *Chlorella spp, Ulva spp.*(sea lettuce), *Caulerpa lentilifera* (Sea grapes), *Ulva intestinalis.*

Brown seaweed- *Saccharina japonica* (kombu), *Postelsia palmaeformis* (sea palm), *Saccharina latissima* (Sugar kelp), *Undaria pinnatifida* (Wakame), *Eisenia bicyclis* (Arame), *Laminaria digitata* (Oarweed), *Undaria undarioides* (Hiromi), *Mastocarpus* (Grapestone), *Sargassum fusiforme* (Hijiki or Hiziki), *Himanthalia elongate* (Thongweed), *Sargassum echinocarpum* (Limu Kala), *Fucus vesiculosus* (Bladderwrack), *Pelvetia canaliculated* (Channelled wrack)

Red algae- *Chondrus crispus* (Irish moss), *Hypnea, Palmaria palmate* (Dulse), *Eucheuma spinosum, Eucheuma cottonii, Callophyllis spp.* (Carola), *Mastocarpus stellatus* (Carrageen moss), *Porphyra* (Nori), *Pyropia* (Gim), *Porphyra laciniata* (Laverbread).

WHAT ARE THE BENEFITS OF EDIBLE SEAWEED?

Edible seaweeds can be used in many dishes, including soups, sushi rolls, salads, supplements and smoothies or for gelling purposes.

Sprinkling some dried sea weeds not only adds taste, texture and flavor on your food but also vitamins and minerals. They are rich in;

- Protein
- Healthy fatty acids
- Copper

- Manganese
- Thiamin
- Fiber
- Riboflavin
- Iron

They contain small amounts of vitamins such as:

- Vitamin A
- Vitamin E
- Vitamin C
- Vitamin B_{12}

And some of minerals such as:

- Zinc
- Calcium
- Sodium
- Magnesium

Edible seaweeds may avoid several diseases such as heart diseases and diabetes. They can also protect your body cells from free radical damage. Seaweeds contain a wide range of phytochemicals that can lead to antioxidant effects.
That's why seaweeds are highly recommended in your food preparations. But it is not yet a trend in Sri Lanka because of lack of knowledge, lack of technology for value addition and considerations on marrine pollution. But it is a delicious food as well as a powerful nutrient source. So, let's try it.

Seaweed is cool.. isn't it?

Tips to reduce the occurrence of toxic substances during food processing

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- In food processing different compounds can get synthezised, which can be toxic to the consumer.
- Blanching, refregeration/ chilling, dehydration are some of the food processing methods.
- Chemicals added or created during food processing can be anti-nutritive substances, toxicants, or pro-toxicants.
- Anti-nutritive chemicals or processes will block, interfere, or destroy nutrient availability.
- Pro-toxicants added or created during food processing can undergo toxication during digestion or biotransformation.

Following are some toxicants that can form during food processing:

1. N-Nitrosamine formation from nitrites
2. Polycyclic aromatic hydrocarbons (PAH)
3. Maillard reaction products
4. Amino acid pyrolysates
5. Food irradiation - unique radiolytic products (URPs) from ionizing radiation
6. Lipid oxidation products
7. Lysinoalanine cross-linkage from alkali/heat treatment of proteins
8. Acrylamide formation in foods prepared at high temperatures

N-NITROSAMINE FORMATION FROM NITRITES

- Curing meat and fish products can lead to the formation of N-Nitrosamine compounds under high temperature due to the high availability of the proteins in those products. Such toxic compounds are carcinogenic and mutagenic.

- The temperature attained by the fats in frying or equivalent cooking processes, such as grilling and mirowave heating.
- Sausages like processed food products are preserved with many additives. Due to the occurrence of nitrosamine, light pink colored spots can be seen within the product. Regular consumption of sausages is linked to the occurence of colon cancer.

POLYCYCLIC AROMATIC HYDROCARBONS

- Polycyclic aromatic hydrocarbons (PAHs) emerged as an important contaminant group in a several processed food groups like dairy, nuts, herbs, beverages and meat products. It get occurred due to the different cooking processes and processing techniques like roasting, barbecuing, grilling, smoking, heating, drying, baking, ohmic-infrared cooking.

- The occurrence of PAH can be reduced by the following methods.

    - By choosing correct cooking method
    Incomplete combustion or pyrolysis is the main mechanism involved in PAH formation in most of the food items, thus it becomes mandatory to avoid such conditions favoring its formation.

- By controlling the time and temperature
  Therefore using liquid is recommended to control the temperature.

- Use and re-use of oil
  Reusing edible oils in cooking especially during frying of food products may be accompanied by PAH level increment. By avoiding reuse of oil the PAHs increment can be reduced.

- Choose a suitable fuel and heat source
  To reduce PAH formation in smoked sausages, it is recommended to substitute beech wood with suitable woodchips-spice mix and sugarcane bagasse is regarded as a safe smoke generator for fish curing process replacing all other hardwood based fuels.

- Application of suitable ingredients
  Addition of spices, mainly onion and garlic is suitable to reduce the occurrence of PAH.

- Remove the casing of meat product before eating it so as to reduce the risk exposure due to these contaminants

- Deshelling and washing also helps to minimize the occurrence of PAH.

MAILLARD REACTION PRODUCTS

Nonenzymatic browning is a process that also produces the brown pigmentation in foods, but without the activity of enzymes. The two main forms of non-enzymatic browning are Caramelization and the Maillard reaction.

- Maillard reaction is responsible for the production of the flavor when foods are cooked. Examples of foods that undergo Maillard reaction include breads, steaks, and potatoes.
- It is a chemical reaction that takes place between the amine group of a free amino acid and the carbonyl group of a reducing sugar, with rich in carbohydrates and proteins tends to have this process when exposed to high heat.
- During this process acrylamide can form which causes cancers.
- Acrylamide is formed in potato products like potato chips, French fries, and in coffee under high temperatures. (Above 120^0)

By reducing the occurrence of Maillard reaction, synthesis of acrylamide can be controlled. Following are some methods.

- Limiting cooking methods, such as frying and roasting Doing boiling and steaming instead.
- Soak raw potato slices in water for 15 to 30 minutes before frying or roasting.
- In roasting and frying, cook it up to the lighter color which produces less acrylamide.
- Avoid storing potatoes in the refrigerator.

When considering the overall process of browning it negatively affects the shelf life, quality and organoleptic properties and positively affect the flavor, color of the coffee, cocoa like food commodities.

AMINO ACID PYROLYSATES

- Heterocyclic aromatic amines (HCAs) are formed during grilling of meat, fish, or other high protein-rich foods.
- High temperature thermal degradation products of tryptophan and other amino acids are formed and Maillard products are formed (pyridines or pyrazines, and aldehydes) with creatinine.

LYSINOALANINE CROSS-LINKAGE FROM ALKALI/HEAT TREATMENT OF PROTEINS

- Lysinoalanine synthesis arises from alkali and heat treatment of proteins and it has some influence on lysine bioavailability.
- It reduces protein digestibility.
- It has a strong affinity for copper and other metal ions and due to that enzyme inactivation can occurr.

LIPID OXIDATION PRODUCTS

- Snack foods, nuts, and other foods that taste bitter and rancid have likely undergone lipid oxidation.
- Chemical reactions such as lipid oxidation cause products to degrade by affecting flavor, odor, and/or color when free radicals take electrons from fatty acids in a chain reaction.
- Water activity is one of the most useful tools to control lipid oxidation.
- Active packaging technology is the most applicable method to reduce lipid oxidation. Utilization of oxygen absorbing sachets can help to reduce the oxygen content of packaged foods.
- Therefore with the proper packaging and storing the lipid oxidation can be reduced.

Generally, the occurence of toxic compounds can be reduced by the following methods.

- Cook under the low temperature
- Reduce the cooking time
- Soaking or blanching the food commodities before processing
- Avoid the use of non stick pans
- Avoid cooking outside. Because contamination can affect the formation of toxic compounds.
- The use of canned products and plastic packaged products should be reduced.
- Commodities like potatoes should not stored in the refrigerator
- Proper packaging and proper storage.

Proper packaging and storing can reduce the lipid oxidation.

To the scientists tasked with keeping us all safe from food born illnesses, we are committed to advancing food and beverage safety and quality today, by developing the most trusted and reliable products and services providing improved lab testing efficiency regulatory compliance for food manufacturers who care about tomorrow.
Because we all want to trust what we eat.

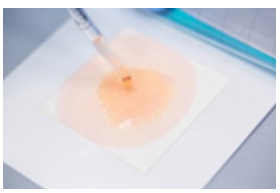
Pick the Right One at a Glance – Color-coded MC-Media Pads®

The MC-Media Pad® is designed for convenient and rapid routine testing of microbial contaminations in your food and beverage products. The pads are coated with a growth medium and chromogenic substrates for specific detection allowing faster results and improved readout. When the sample is applied, the liquid spreads evenly on the pad by capillary action. No additional working steps are required, improving the workflow and reducing the risk of contamination. The transparent cover film can be easily opened and closed with one hand, and the color coding ensures that you can always pick the right one at a glance. MC-Media Pads® comply with international standards (AOAC, MicroVal) and are quality controlled with strain selection according to ISO 11133.
Enjoy the benefits of a ready-to-use method
Why stick to traditional media plates if there is an alternative available which can improve your workflow, while providing accurate and reliable results? MC-Media Pads® are ready-to-use and provide additional features for your financial benefit and cost-efficiency:'

- Save space in your fridge and incubator
- Go green & gain: reduce your environmental impact
- Improve your inventory management with a shelf-life of up to 36 months
- Comply with regulations
- No spreading device required
- Simplify your workflow:

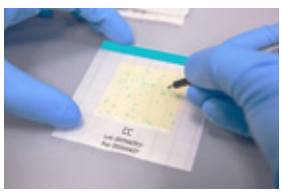
Workflow example with MC-Media Pad® Coliform

Open the cover film diagonally, then inoculate sample to center of the pad.



After inoculation, sample will diffuse automatically into the whole pad.

Close the cover film and incubate according to application conditions.



Count.

Just pick the color you need

The MC-Media Pad® portfolio offers a broad range of products for the main applications in the food and beverage industry. Use of chromogenic indicators leads to specific results and allows for better interpretation. Just incubate at 25 °C or 35 °C for 24-48 hours to detect dedicated contaminants.

Rapid Aerobic Count

Incubation: 35 °C, 24 hoursReadout: All grown colonies develop reddish color. Regardless of strength of color, all grown colonies should be counted.

Short time to result

Coliform

Incubation: 35 °C, 24 hours Readout: Coliforms produce blue/blue-green colored colonies due to β-galactosidase production. Gram-negative non-coliform bacteria form colorless colonies. Regardless of strength of color, all blue/blue-green colored colonies should be counted.

Easy readout thanks to blue colored colonies

E.coli and Coliform

Incubation: 35 °C, 24 hours Readout: Coliform bacteria form blue/blue-green colored colonies due to β-galactosidase production, whereas E. coli will produce indigo to purple colored colonies due to specific β-glucuronidase. Gram-negative non-coliform bacteria forms colorless colonies. Regardless of strength of color, all colored (blue/blue-green and purple/navy) colonies can be determined as total coliform. Only purple to navy colored colonies should be counted as E. coli.

Chromogenic approach: easy differentiation between E.coli and Coliform colonies & no gas formation required

Yeast & Mold

Incubation: 25 °C, 48 hours Readout: All grown colonies will develop a reddish color. Regardless of strength of color, all grown colonies should be counted. Yeast and Mold can be easily distinguished by their different morphologies. Yeasts will appear as circular reddish colored colonies, whereas mold colonies are also round and reddish in color, but will appear more diffuse with fuzzy edges.

Time to result for various matrices in 48 hours, appropriate sample area to avoid spreading of the molds and ensure valid readout

Our Achievements

- Winner – Best green innovation (Institutional category)- Pro Food Pro Pack Agbiz exhibition 2019
- 1st Runner up – Most innovative product (Institutional category)- Pro Food Pro Pack Agbiz exhibition 2019
- 2nd Runner up – Commercial viable product (Institutional category)- Pro Food Pro Pack Agbiz exhibition 2019
- 1st Runner up – Most innovative process (Institutional category)- Pro Food Pro Pack Agbiz exhibition 2018
- 2nd Runner up – Best stall (Institutional category)- Pro Food Pro Pack Agbiz exhibition 2018
- Ms. Narmada Weerakkody and Ms. Shammi Hettiarachchi Participated in the Grand Finale held in New Delhi and won the 4th place out of 165 teams from Universities and colleges of 10 countries in Asia at the SKA Asia Food Safety quiz competition and awarded the title of Food Safety Ambassador by the Food Safety and Standard Authority of India (FSSAI) and Confederation of Indian Industry (CII).
- Silver Medal for Environmental conservation of Sahasak Nimavum 2018 National Exhibition won by T. Niroshan
- Winner of Sampath Green Inventor 2017- T.Niroshan
- Runner up - Inter University Food Science Quiz Competition 2017- Conducted by the Institute of Food Science & Technology Sri Lanka
- 1st Runner Up - Commercially viable product (Institutional Category) - Pro Food Pro pack Agbiz exhibition 2016
- Winner - Best Stall (Institutional Category) - Pro Food Pro Pack Agbiz exhibition 2015
- 1st Runner Up - Commercially viable product (Institutional Category) - Pro food Pro pack Agbiz exhibition 2015
- 1st Runner Up - Most Innovative product (Institutional Category) - Pro food Pro pack exhibition Agbiz 2015

A glimpse of some of our past events..

Laboratary Chemicals, Glass Ware & Equipment

Neochem pursued a strategy of diversification and innovation in the industry. As a result, we are very pleased to introduce our high purity and excellent quality Chemical, Laboratory Reagents, Consumables & Glassware, Cultural Media and Equipment that meet international standards and specification.

CHEMICALS, GLASSWARE & CONSUMABLES

- Organic & Inoganic Chemicals
- AR/LR Grade Laboratory Chemicals
- High Purity Solvents & Acids
- Buffer Solutions & Capsules
- PH Indicators
- High quality glassware &
- All required Consumables

MICROBIOLOGY/MOLECULAR BIOLOGY SUPPLEMENTS

- DCM (Dehydrated Culture Media)
- Biological Samples
- Reagents
- Primers
- Cell Culture, Media & Supplements Test kit

HIGH TECHNOLOGY EQUIPMENT

- Chemical Analysis
- Sample Preparation
- Air quality monitoring
- Material Characterizing
- Pharma Industry

GENERAL LAB EQUIPMENT

- Ovens, Incubators, Water Baths, Autoclave Balances

SPECIALTY CHEMICALS

- Standards & CRMs (Certified Reference Materials)

LABORATORY DESIGNING & FURNISHING

MERCK

SIGMA-ALDRICH

DragLab

CRUMA
Laboratory equipment made in Barcelona

LabTech

witeg
GERMANY

Anton Paar

OHAUS

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