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CAS JAMAICA

FOOD SAFETY NEWSLETTER

IN THIS ISSUE

A letter from the editor

Did you know that the consumption of some species of mushrooms can lead to foodborne illness? Mushrooms are fruiting bodies produced from macrofungi. Some mushrooms are edible while others are toxic. Edible mushrooms are widely utilized in Asian and European cuisine. Mushroom hunting is a popular past time in Switzerland. The season runs from August through to October. In Switzerland due to fatalities associated with the consumption of toxic mushrooms, there is a Swiss Mushroom Association and Mushroom inspectors who generally inspect mushrooms without charge to the consumer. Of the 40 tonnes of mushrooms inspected in Switzerland in 2022, 33 tonnes were considered safe for consumption. Prior to the implementation of these measures, up to five fatalities were reported annually due to the consumption of toxic mushrooms. Smartphone applications have also been created to assist in identifying toxic mushrooms but should not be used alone to ascertain the safety of mushrooms for consumption. There are incidents wherein mushrooms have been incorrectly identified. The stem of the mushroom is a key feature utilized in its identification.

Recently a severe case of mushroom intoxication was reported in Australia. Three elderly persons died from eating a meal prepared with *Amanita phalloides* (death cap mushrooms). The mushrooms were utilized in the preparation of a dish called beef wellington. The beef fillet was wrapped with a pâté containing the deadly mushrooms. Consumption of this mushroom, the size of a coin, can lead to death. Symptoms occur 6 - 12 hours after consumption and include: nausea, diarrhea, vomiting, abdominal pain and low blood pressure. The lethality of the mushroom is due to the presence of amatoxins, phallotoxins and virotoxins. These toxins are heat stable. The amatoxin, α-Amanitinis is most virulent inhibiting RNA polymerase II, preventing cells from performing essential functions such as creating proteins. The primary site of action is the liver. Typically, there is a period of remission when patients feel like they are recovering. This is however short lived and secondary symptoms appear thereafter. The liver is the first organ to fail followed by the kidneys.

Antidotes are not very effective as the binding of the amatoxin to its target is largely irreversible. The antidote would need to be administered relatively early after the consumption of the mushroom. This however can be challenging as persons are not usually aware of the food poisoning until several hours later when symptoms start to emerge. The primary antidote utilized is silibinin. Indocyanine green was recently identified as another potential antidote. Mushrooms are also able to cause allergic reactions from their direct consumption or the inhalation of spores.

Not all mushrooms are poisonous. Examples of edible mushrooms include *Agaricus bisporus* (Portobello mushroom or white button mushroom), *Lentinula edodes*, (Shiitake mushroom) and Pleurotus species (oyster mushroom). They are known for their umami flavour and are a good source of proteins, antioxidants and Vitamin D.

Figure 1. Button Mushrooms

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Cassareep

By Shenell Beroni

Cassava is a highly regarded staple crop and is ranked in the top three largest carbohydrate sources in the human diet - only behind rice and maize (Clifton and Keogh, 2016). In addition to carbohydrates, cassava also contains a significant amount of calcium, iron, phosphorus and vitamin C and a low percentage of lipids and crude protein (Bayata, 2019). An estimated half a billion persons within the tropical and subtropical regions of the world rely on “sweet” cassava as a dietary component. The use of this cassava variety, which was once regarded as a poor man’s food in many developing countries, has experienced a shift in its importance within the last decade and is recognized for its versatile application in the development of value-added products (Onyenwoke and Simonyan, 2013; FAO, 2016).

The boiling, baking, fermentation, or other processing methods of cassava may form various products which can be used in the production of foods, sweeteners, alcohol, confectionery, glues, starch, plywood, preservatives, drugs and biodegradable products (Onyenwoke and Simonyan, 2013). Furthermore, Ndubuisi and Chidiebere (2018) describe the cassava crop as invaluable to food security on account of its extreme resistance to weeds, pests, diseases and droughts, and its ability to yield in poor soil and climatic conditions. As a source of food, cassava is the main ingredient of many recipes and food products in different regions worldwide serving as meals, breads, desserts, flour, snacks, sauces and alcoholic beverages (Shigaki, 2016).

Cassareep is a thick, black syrup made from the extract of bitter cassava (juice might indicate that it is good to drink?) tubers (Shigaki, 2016). This cassava derivative is most often used in Guyana as a base in different sauces and in their national pepperpot dish (stew made of different combinations of meats, namely beef, pork, mutton, oxtail, cow-foot and-or chicken.

Cassareep is appreciated for its distinguishing bittersweet, smoky, yet savoury flavour (Shigaki, 2016). However, of greatest significance is casareep’s function as a preservative. The addition of cassareep to stews and pepperpot is said to hinder the spoilage of cooked meat. Several accounts have indicated the possibility of pepperpots lasting for many days to couple years without refrigeration, even in places known to have high environmental temperatures (Dufford, 2012) (as long as dirt utensils are not used to serve this dish during that period). However, Dufford (2012) and Nelson (2019) highlight that this preservation by cassareep may be under the condition that the stew is reboiled at least once per day. Given the unique flavour profile and preservative action, adapted forms of the cassareep seasoned with spices, such as pepper, sugar, salt are bottled for sale locally in Guyana and also for exportation to Barbados, Canada and The United States of America (Dewprshad, 2009; Shigaki, 2016; FAO, 2016).

Figure 2. Cassava, The Millenium Crop

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Biofilms and their significance in the Food Industry

by Sonal Gupte

Antonie Philips van Leeuwenhoek was the first to discover biofilm on the surface of a tooth using a basic primitive microscope. The term biofilm was coined by Costerton in 1978. Biofilm is a group of bacteria, algae, yeast or fungi that grows attached to a surface. This surface can be a living or non-living body. Examples of living bodies acting as surfaces include bacteria on gums and teeth. An example of a non-living body is a stainless steel surface. Biofilms are complex association of cells extracellular products and detritus either trapped within the biofilm or released from cells which have lysed as the biofilm ages (Sutherland 2001). In nature biofilms can have high levels of organization, as they may exist in single or multiple species community. They can form a single layer or a three dimensional structure and can also take the form of floccules or grains (Allison and Sutherland, 1987). The ability of bacteria to produce extracellular polysaccharides is responsible for these bacteria sticking to surfaces and forming biofilms ((Sutherland 2001). Additionally, the biofilm is a matrix structure of extra polymeric substances. The mechanical stability of biofilms is provided by extracellular polymeric substances. The major component of biofilm is liquid medium which is primarily water (Shaw et al., 2004). Extracellular polymeric substance may contain polysaccharide glycocalyx, proteins, phospholipids, teichoic, nucleic acid and other polymeric substances (Flemming and Wingender 2010).

Biofilms occur on a wide variety of food surfaces (de Souza, 2014). Utensil surface, pipelines where liquid food such as milk, juices flow are major areas where biofilms formation takes place (Chmielewski and Frank, 2003). The biofilm attach to the substrate and cannot be removed by rinsing (Ray and Bhunia, 2013). They develop at places where they get sufficient nutrients to grow and proliferate. Food products such as milk, fruits, vegetables and meat provide good source of nutrients to the micro-organisms which provides the right conditions for biofilms to thrive and proliferate.

Biofilms are dynamic and affect us in all walks of life. In order to provide safe products to the consumers and to have products with longer shelf life, it is important that the processors work towards devising protocols to have effective cleaning and hygienic manufacturing practices. A single method for preventing the formation of biofilms will not always be feasible. Processors will have to try alternative methods to prevent and eliminate biofilms at different levels of processing. A combination of ancient techniques along with the latest technology will be most effective.

Figure 3. Microorganisms

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Food Packaging: Cans

By Trishana Chevannes

Metal packaging is widely used in the food manufacturing industry, due to its convenience and ability to preserve food over a long time period. 2 piece and 3 piece cans were evaluated visually and physically for defects. A defect is any unwanted feature of a product. The defects seen in the experiment varied from minor to critical. A defect is critical if it compromises the hermetic seal. The hermetic seal is important for excluding environmental contaminants and thus preserves the safety and quality of the product.

Cans

Materials which are used to make can include aluminium or tin free steel coated with enamel. Cans can be classified based on their production which results in two piece or three piece cans. A three piece can has a welded side seam and two ends. A two piece can has a side seam but only one end. Two piece cans may be made in two ways; either by DRD or D & I. DRD involves drawing and redrawing and produces thicker cans. D & I involves drawing and ironing and is mainly used for aluminium cans which often contain carbonated beverages which help to maintain the shape of the can. A double seam forms as a result of sealing the end to the body of the can.

Sealing of Cans

The sealing of cans by manufacturers after food is placed in containers involves two operations. The first operation involves interlocking the end curl with the body flange. The second operation irons out the hooks together, also pressing out the sealing compound. This forms a hermetic seal, which prevent the entry of external contaminants. The dimensions for the seam varies based on can sizes and must ideally be within an accepted range for the assurance that the integrity of the seam has not been compromised.

A hermetic seal is important as it maintains the integrity of a product by preventing microbes and other environmental contaminants from entering the product. This in turn prevents spoilage/safety issues with the food within the package. A poor hermetic seal can compromise the safety of the food. Defects seen in the body of the can are not deemed critical as they do not have any adverse effect on the product quality. False seam is a critical defect as it affects the closure, while, denting in the body of the can would be rated as minor.

A hermetic seal is one of the most critical aspects of metal packages. Safety risks as well as spoilage may be associated if a hermetic seal has been compromised. Metal cans can be evaluated for defects visually and physically through a tear down procedure. Defects vary in severity, with the most severe being the defects which results in the hermetic seal being compromised eg. Knock down flange. Cans have specified/accepted ranges for different dimensions based on can type/size. If the dimensions are found to be out of specification for a can, particularly those that affect the integrity of the double seam, the can is deemed unsuitable.

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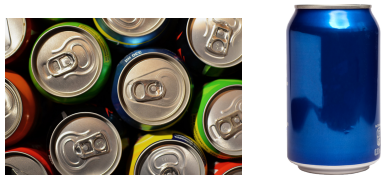

Figure 4. Two piece cans

Ms Trishana Chevannes is a graduate of the MSc Food and Agro Processing Technology Programme at The University of the West Indies, Jamaica. She currently serves as Country Safety Manager at PriceSmart Jamaica.

Potential applications of *Coffea arabica* fruits

By Daina Barrett

The *Coffea arabica* fruit is utilized in the production of coffee beans. During processing most of the fruit is discarded. Coffee fruits are processed by either wet or dry processing methods (Cubero et al., 2017). The byproduct resulting from the manufacture of coffee beans are loaded with antioxidants and polyphenols which are beneficial for brain health, promotes weight loss, lowering blood pressure, and boosting the immune system. Observational studies have shown that coffee may help to reduce certain cancers, heart disease and stroke, type 2 diabetes, and brain disorder.

The utilization of the coffee fruit continues to be of interest to food scientists and consumers. Consumers are becoming more health conscious. The conversion of the coffee fruit pulp into other byproducts would be of economic benefit and also reduces waste which contaminates the environment. Coffee fruit pulp has been utilized in the manufacture of coffee flour, cascara, coffee cherry tea, powder, jam and animal feed. Consideration could also be made with regards to utilizing the fruit in the production of fruit leather.

A fruit leather, also called a fruit bar or fruit slab is a dehydrated fruit based confectionery dietary product. It is often eaten as a snack or desert (Srinivas et al., 2023). Fruit leather are convenient, flavourful, and healthy. These products are usually low in fat, low in calories, high in fibre and are said to be easily stored and packed (Srinivas et al., 2023). It is made from fresh fruit pulp or a mixture of fruit juice concentrate after the dehydration step. There are large numbers of these product available on the market. These include kiwi, mango, grape, apricot, and mixed fruit leathers.

Dehydration is a form of food preservation. It is one of the oldest unit operations used in the food industry. In this operation the moisture content of the food is reduced to improve the shelf-life of the product. Food can be spoiled by food microorganism or through enzymatic reactions within the food. Reducing moisture helps to prevent the growth of micro-organism and slows down enzymatic reaction in foods. Dehydration also imparts desirable features in the food by enhancing the organoleptic quality of a food. This method is utilized in the preparation of fruits and vegetables.

Figure 5. *Coffea arabica fruits*

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Ms Daina Barrett is a graduate of The University of the West Indies, Jamaica with a BSc in Food Chemistry. She currently teaches Chemistry at St Thomas Technical High School

STEM Week, Lister Mair Gilby

On Tuesday, November 21, 2023 we visited Lister Mair Gilby School for the Deaf in celebration of their STEM week. The students were introduced to the 12 Principles of Green Chemistry and engaged in various experiments.

Experiments Conducted

Edible plastics

Red cabbage indicator

UV beads changing colour in the presence of light

12 Principles of Green Chemistry

- Prevention
- Atom Economy
- Less Hazardous Chemical Syntheses
- Designing Safer Chemicals
- Safer Solvents and Auxiliaries
- Design for Energy Efficiency
- Use of Renewable Feedstocks
- Reduce Derivatives
- Catalysis
- Design for Degradation
- Real-time Analysis for Pollution Prevention
- Inherently Safer Chemistry for Accident Prevention

https://www.sigmaaldrich.com/JM/en/technical-documents/technical-article/analytical-chemistry/green-chemistry-principles

Student Feedback

- I had an awesome time learning all the new things about science.
- Fun and inclusive. Activities were very informational. Great team.
- I like the experience when we make sun changing bracelet. It changes colour. when you put out in the sun because of UV lighting.
- You did your best and I hope I get to see you again. Science is fun!!!

Acknowledgements

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Thanks to Ms Daina Barrett for assisting with conducting the experiments.

Congratulations

Photo credit: Prof Robert Lancashire

Congratulations to our newly appointed CAS Fellows Dr Marvadeen Singh-Wilmot and Dr Nagarani Ponakala (L-R).

Congratulations to Ms Zoie Aimey on successfully defending her MSc Thesis. The title of her research paper was “Thermal stability of ackee (*Blighia sapida*) aril oil and changes in its α-tocopherol and β-carotene content upon heating”. Her work will be presented at the upcoming Mona Symposium which will be held on January 3 to 6, 2024 at The University of the West Indies, Jamaica. Ms Aimey has co authored 3 publications:

- Aimey, Z., Goldson-Barnaby, A., Bailey, D. (2020). A review of Cordia species found in the Caribbean: *Cordia obliqua* Willd., *Cordia dichotoma* G. Forst and *Cordia collococca* L. International Journal of Fruit Science. 1-10.
- Aimey, Z., Mowatt, K., Gupte, S., Warren, D., Goldson-Barnaby, A., Sadler-McKnight, N., Reid, R. (2023). Characterization of *Blighia sapida* seed extracts. Anais da Academia Brasileira de Ciências. 14;95 (suppl 1): e20201459
- Aimey, Z., Roye, C., & Goldson-Barnaby, A. (2023). Thermal stability, α-tocopherol and β-carotene content of ackee (*Blighia sapida*) aril oil: 10.55434/CBI.2023.10104. Caribbean Journal of Sciences and Technology, 11(1), 21–29

Word Search
Mushrooms

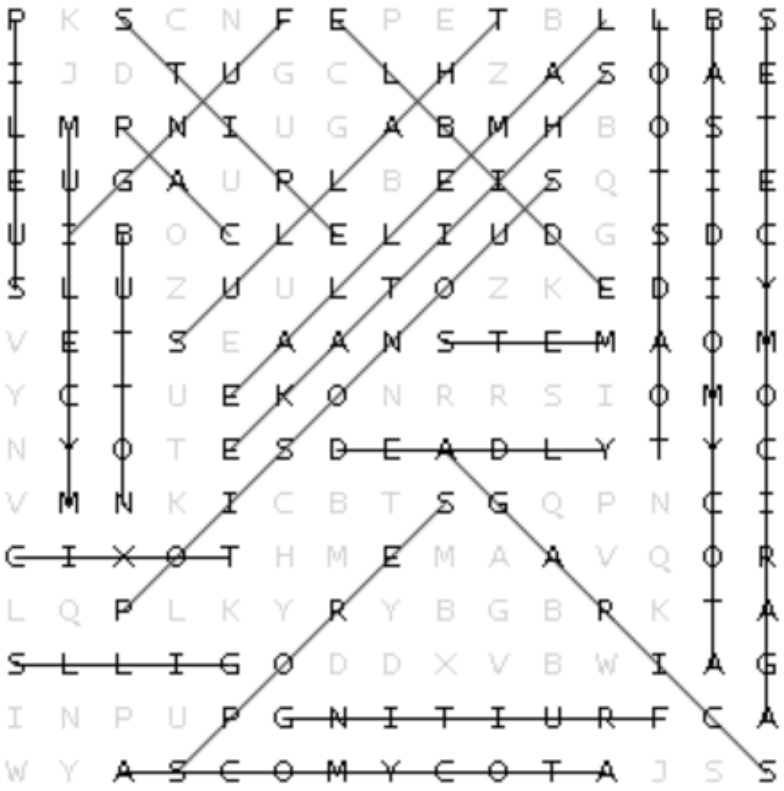
P K S C N F E P E T B L L B S
I J D T U G C L H Z A S O A E
L M P N I U G A B M H B O S T
E U G A U P L B E I S Q T I E
U I B O C L E L I U D G S D C
S L U Z U U L T O Z K E D I Y
V E T S E A A N S T E M A O M
Y C T U E K O N R R S I O M O
N Y O T E S D E A D L Y T Y C
V M N K I C B T S G Q P N C I
C I X O T H M E M A A V Q O R
L Q P L K Y R Y B G B R K T A
S L L I G O D D X V B W I A G
I N P U P G N I T I U R F C A
W Y A S C O M Y C O T A J S S

Agaricomycetes
Basidiomycota
Deadly
Fungi
Mycelium
Shiitake
Stipe
Toxic

Agarics
Button
Edible
Gills
Pileus
Spores
Thallus

Ascomycota
Cap
Fruiting
Lamellae
Poisonous
Stem
Toadstool

Word Search Solution



Caribbean Academy of Sciences Jamaica

Wishes you every success for 2024