



HEALTH RISKS ASSOCIATED WITH SPECIFIC FOOD ADULTERANTS

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ABSTRACT:

This project examines the health consequences of food adulterants, with a focus on Urea, melamine, and artificial colours like metanil yellow. Food adulteration, or the Deliberate addition of less expensive ingredients to food products, poses a serious Risk to consumer health everywhere. This study evaluates the toxicological profiles And chemical characteristics of selected adulterants, pointing out that minute doses Can have both immediate and long-term negative health impacts. Melamine is linked To kidney stones and nephrotoxicity. It is commonly combined with milk products To falsely raise protein levels. Urea can cause liver damage and gastrointestinal Negative effects. It is also used to falsely exaggerate protein levels. A commercial Colourant used to enhance spices, methenil yellow, has been linked to hepatotoxicity, Neurotoxicity, and potential carcinogenicity.

Keywords: Food Adulteration, Melamine, Urea, Metanil Yellow, Boiling Test With NaOH, DMAB Colorimetric Test, Hydrochloric Acid Color Reaction, Public Health Risks, Food Safety, Rapid Detection techniques.

Introduction :

Any substance made up of carbohydrates, water, fats, and proteins that may be Consumed by humans and animals for energy is considered to be food, which is a Significant lifestyle concern . It supports growth in people and upkeep and is a Fundamental need for essential nutrients. A healthy lifestyle depends on both the Quantity and quality of food consumed. However, food quality is negatively Impacted by adulteration now a days.

Food adulteration is a common worldwide food fraud practice that threatens food Safety. The lives of people are seriously Threatened by these heinous and careless means of accumulating enormous Money. Economically motivated adulteration (EMA) is the intentional Adulteration of food for financial benefit. In addition to being an economic crime, It also seriously compromises public health. Dairy products, grains, seafood, oils, alcoholic beverages, honey, fruits, and Vegetables are among the many food items that are susceptible to food Adulteration. Finding food that is free of one adulterant is therefore challenging. Nearly half of the food consumed daily is contaminated, according to the most Recent data on food products. According to another report, around 22% of foods Are adulterated each year.

Research Objectives

Health Risk Assessment:

Assess the toxicological profiles of melamine, urea, And synthetic dyes such as metanil yellow, and determine their health effects According to exposure levels in the population.

Detection Methodologies:

Developing and validating quick, easy, and Reasonably priced detection techniques for common food adulterants is the goal Of this project. Using readily available reagents and basic equipment, the goals Are to detect melamine, urea, and metanil yellow in a variety of food samples; to Develop trustworthy preliminary screening methods that do not necessitate Complex laboratory setups. And to assess the efficacy of these methods in terms of sensitivity, specificity, and practicality. The goal of this project is to ensure Safer consumption patterns by promoting affordable and easily available Technologies for frequent food quality evaluation.

Research the Relationship Between Food Adulteration and Chronic Disease:

Analyze the possible connections between the long-term intake of Adulterated food and the onset of chronic diseases like cardiovascular disease, Diabetes, and neurological disorders.

2.4 Assessing Consumer Knowledge and Awareness:

Measure the extent of Knowledge among various demographic segments about food adulteration, its Frequent forms, and related health hazards. Determine knowledge gaps and Misconceptions that can result in the intake of adulterated food items. It is critical to address food adulteration with chemicals such as melamine, urea, And artificial color, in order to protect public health. This study would attempt to Provide a comprehensive understanding of the health risks associated with food Adulteration, enhance detection methodologies, and inform public health Strategies to mitigate adverse health outcomes.

3. Materials and Methods

3.1 Urea Detection in Milk (Colorimetric Estimation using DMAB Reagent)

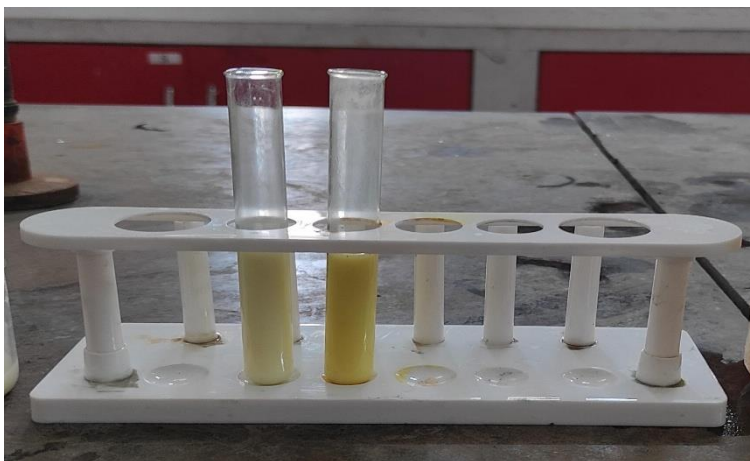
Principle: Urea, a natural non-protein nitrogen compound in milk, can indicate adulteration when found in excess (>70 mg/100 ml). It reacts with para-dimethylaminobenzaldehyde (DMAB) in a weakly acidic medium to form a yellow complex. The intensity of this color is used for both qualitative and quantitative analysis.

Sample Preparation: Milk samples are treated with 24% trichloroacetic acid (TCA) to precipitate proteins. The clear filtrate is then used for further testing.

Qualitative Method:

Reagent: We prepared DMAB reagent by dissolving 1.6 g of para-Dimethylaminobenzaldehyde in 100 ml of ethyl alcohol and then adding 10 ml of Hydrochloric acid .

Procedure: We withdrew 1 ml of each sample of milk and mixed it with 1 ml of The DMAB reagent. The resulting mixture was left at room temperature. Adulterated milk samples showed a clear yellow color due to added urea, while Control samples with their normal levels of urea had very little yellow color. The Process had a detection limit of around 0.2% of added urea.



Metanil Yellow Detection in Food (Color Reaction Test)

Principle: Metanil Yellow, an illegal azo dye, reacts with concentrated HCl to produce a violet/magenta color, distinguishing it from natural food colorants.

Sample Preparation & Procedure: Crush and dry 2 g of the food sample (e.g., turmeric). Extract with 5 ml ethanol and shake well. Filter the extract into a clean test tube. Add 2–3 drops of concentrated HCl. Violet color indicates presence of Metanil Yellow.



Impact of Adulterants on Health

□ **Chronic Kidney Disease (CKD)** :Clinically, urea is used to indicate the degree of chronic kidney disease And the effectiveness of dialysis. Very high blood levels of urea, which May result from extreme dehydration, overconsumption of protein with Compromised kidney function, or some metabolic diseases, may Overwhelm the kidneys and lead to kidney injury.

□ **Impact on Cardiovascular system:** Elevated blood urea levels in people With chronic kidney disease significantly raise their risk of cardiovascular Disease. It has been discovered that urea increases risk through a number Of different mechanisms. The first is that urea directly affects Cardiovascular cells, influencing smooth muscle cells in the arteries. Vascular tone and reactivity may be impacted by this interaction. Furthermore, it has been discovered that urea increases the expression of Genes that cause the cells lining the artery walls to undergo programmed Cell death, or apoptosis.

□ **Impact on the Digestive System:**Food tainted with metanil yellow enters The human body directly through the digestive tract, starting a cascade of Potentially harmful consequences. Research indicates that there is a Significant risk of direct intestinal damage, hepatotoxicity, or liver damage, And gastrotoxicity, or stomach injury. All of these toxic consequences Could disrupt these vital organs' normal function, resulting in a number of Detrimental health impacts. Damage to the stomach lining and gastric

Result & discussion

Urea

Color Test (Qualitative)

- Bright yellow = urea possibly added
- Pale yellow or no color = normal

Metanli Yellow

The formation of a violet to magenta coloration on the addition of Concentrated HCl established the presence of Metanil Yellow in the turmeric Sample. This established that the turmeric sample was adulterated with the Synthetic dye.

Conclusion

The research results demonstrate that melamine adulteration, particularly in milk, Is a serious risk to renal function that can lead to kidney stones and even renal Failure. When used to determine protein content, an elevated urea measurement Was found to be associated with a risk of kidney damage, gastrointestinal Disorders, and liver failure. Similarly, the discovery of metanil yellow in turmeric Highlights the dangers of consuming artificial colours, which have been Connected to neurotoxicity, hepatotoxicity, and cancer.

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