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Development Of Kit For Urea Detection In Milk And Experimental Study On Spread Of Adulteration

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ABSTRACT

Adulteration of food products, especially milk, poses a significant threat to public health and safety. The use of urea as an adulterant in milk is a common practice, leading to serious health risks. To address this growing concern, we have developed IKshan, a revolutionary urea detection kit made from soybean flour, offering a simple, eco-friendly, and cost-effective solution for identifying urea adulteration in milk. The name meaning "care" in Hindi, reflects our commitment as pharmacists to prioritize the well-being of society.

This study investigates the spread of adulteration in commonly used food items such as turmeric powder, milk, ghee, and edible oils. Various adulteration testing methods were employed across different samples, and the results were analyzed graphically to distinguish between adulterated and unadulterated samples. The graphical representation highlights the extent of adulteration and its widespread nature in everyday consumables.

Through the development of strip, we aim to provide a reliable tool for consumers to easily detect urea in milk, ensuring better food safety practices. The findings of this study underscore the necessity for innovative solutions to combat food adulteration, ensuring the safety and integrity of products consumed daily.

Keywords: Adulteration, Unadulterated, Consumers, Urea.

INTRODUCTION

Food adulteration is a serious issue affecting public health, with contaminants being added to essential food products like milk, spices, and edible oils to increase quantity and profitability. Among various adulterants, urea is commonly used in milk to enhance its consistency and shelf life. However, the consumption of adulterated food can lead to severe health issues, including kidney disorders, liver damage, and gastrointestinal problems.

This study focuses on detecting adulteration in various food products such as turmeric powder, ghee, milk, edible oil, chili powder, and spices, ensuring consumer safety. A special emphasis is placed on the development of Strip , a user-friendly and efficient kit for the detection of urea in milk. The kit aims to provide a simple, rapid, and reliable method for identifying the presence of urea in milk, helping both consumers and regulatory authorities combat food adulteration.

Through experimental analysis and systematic testing, this project not only highlights the extent of food adulteration but also contributes to developing accessible and effective solutions to detect harmful substances in food.

OBJECTIVE

- To analyze food adulteration — Study and identify the presence of adulterants in commonly consumed food items like milk, spices, oils, and ghee.
- To develop the kit — Design and formulate a simple and effective detection kit for identifying urea adulteration in milk.
- To test various food samples — Conduct laboratory-based experiments to detect adulteration in different food products.
- To create awareness — Educate consumers about the risks of adulterated food and the importance of quality testing.
- To provide a reliable detection method — Ensure that the developed kit is easy to use, affordable, and accessible for detecting urea in milk.

- To support food safety regulations — Contribute to quality control measures by providing a scientific basis for detecting adulteration in food.

LITERATURE REVIEW

1. Food Adulteration and Some Methods of Detection, Review

   Misgana Banti

   Adulteration involves adding inferior or harmful substances to products, often to deceive consumers and increase profits. It can occur in various forms, such as mixing harmful ingredients, using prohibited chemicals, or altering food quality to appear more appealing.

2. Recent Developments in Food Characterization and Adulteration Detection:

   Technique-Oriented Perspectives

   Christophecordellal ,Issammoussa2,Anne-clairemartel,Nicolassbirrazzuoli, Louisette lizzani cuvelier

   Spectroscopic techniques like IR, NMR, and Raman are used for non-destructive food analysis, while chromatographic methods such as GC and LC help detect contaminants and verify food composition. Chemometric approaches enhance data analysis for accurate food authentication. These methods are applied across various food products, including oils, dairy, honey, and meat, to identify fraud and contamination.

3. Determination of Adulterants in Food: A Review

   M. Kartheekl, A. Anton Smith*2, A. Kottai Muthu and R. Manavalan3

   Powdered milk in Brazil is increasingly adulterated, primarily with whey, starch, sucrose, and other substances like maltodextrin and sodium hydroxide. These adulterants are detected using chromatographic techniques, iodine, titration, and HPLC to ensure quality and prevent health risks.

4. Advances in adulteration and authenticity testing of turmeric (Curcuma longa L.)

   B Sasikumarl

   Adulteration involves mixing or replacing original materials with inferior or harmful substances, often for financial gain. It can be intentional, where cheaper substances are deliberately substituted, or unintentional, due to errors in testing or handling. Turmeric adulteration, a long-standing issue, has gained more focus in recent years due to improved detection methods for identifying adulterants in commercial turmeric products.

5. Adulteration of milk: A Review

   Sneh Lata Chauhan, Priyanka, Kruti Debnath Mandal, Babul Rudra Paul and Chinmoy Maji

   Milk adulteration poses health risks and affects quality. Various methods are used to detect adulterants: water adulteration is observed by the flow on a slanted surface, starch turns blue-black with iodine, and urea is tested with litmus paper. Synthetic milk has a bitter taste and yellow color when heated, while microbial contamination is checked with the Methylene Blue Reduction Test. Detection of sucrose,

melamine, and antibiotic residues is crucial for ensuring safe milk and preventing health issues like antibiotic resistance.

METHODOLOGY AND MATERIAL

1. Turmeric powder: -

Biological Name- Curcuma Longa

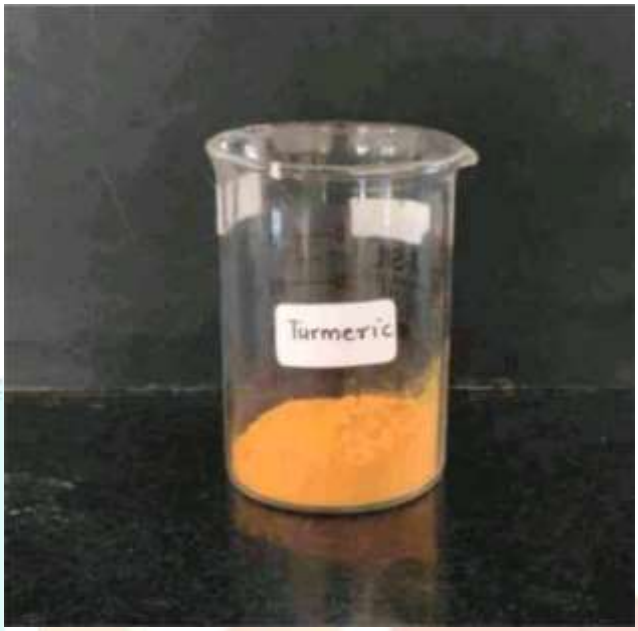


Figure 1 :- Turmeric Powder Sample

1. Introduction

Turmeric powder, derived from the dried rhizomes of the Curcuma longa plant, has been used for centuries in culinary practices, traditional medicine, and textiles. The spice has several bioactive compounds, primarily curcumin, which are responsible for its therapeutic properties, including anti-inflammatory, antioxidant, and antimicrobial effects. However, the growing global demand for turmeric has made it a prime target for adulteration. Adulteration not only reduces the quality and authenticity of the product but can also pose serious health risks to consumers.

2. Types of Adulterants in Turmeric Powder

3. Detection Methods for Adulteration

1. Physical Examination

Visual inspection of turmeric powder can sometimes reveal the presence of foreign substances such as chalk or synthetic colorants.

However, this method alone may not be sufficient

3. Chemical

TeStS:-Lead Chromate

Detection: Lead chromate can be detected using a simple test by dissolving the turmeric powder in water and adding a dilute hydrochloric acid solution. A yellow precipitate indicates the presence of lead chromate.

2. Microscopic Examination

Microscopic examination of turmeric powder can help identify foreign plant particles or starches mixed with the powder. Specific starch grains, such as those of rice or corn, are easily distinguishable under a microscope.

4.Synthetic Dye Detection: Metanil

yellow and other synthetic dyes can be identified using chromatography techniques or by dissolving turmeric in alcohol and examining the resulting solution for the presence of synthetic colors.

4. Health Risks Associated with Adulterated Turmeric

4.1. Lead Poisoning

Lead chromate and other forms of lead are toxic and can lead to lead poisoning, which affects the nervous system, kidneys, and liver.

- Chronic exposure can result in developmental delays in children, hypertension, and a weakened immune system.

4.2. Cancer

Metanil yellow and other synthetic dyes have been linked to carcinogenic effects. Long-term consumption of foods tainted with such dyes can increase the risk of cancer, particularly in the liver and gastrointestinal system.

4.3. Allergic Reactions

•Some adulterants, such as starches and other plant powders, can trigger allergic reactions in sensitive individuals. Symptoms may include skin rashes, digestive issues, and respiratory distress.

We collected turmeric powder samples from different vendors and conducted adulteration chemical testing. The test results are shown below.

Sam le (Turmeric Powder)										
Test No.l	1	2	3	4	5	6	7	8	9	10
1 .lodine Test Iodine solution can be added to a sample and if turns blue it indicates the presence of starch										
2.Alc0h01 Solubility test Take Sample is dissolved in ethanol turn solution ellow										
3. Colour reaction test Sample can be treated with different acids and bases ex. Turmeric powder mixed with dilute alkali like sodium hydroxide it may change colour 1. sodium hydroxide 2.Hydrochloric acid 3.Nitric acid										

4.1\2 tea spoon full of powder +add HCL acid +appear pink colour disappear on dilution with										
water shows presence of turmeric if colour persist measure yellow not permitted coal tar										
5.Take a glass of water small quantity of Sample to the water unadulterated sample turns light yellow Sample settle down at bottom adulterated turmeric changes into stron. Yellow										
6. lgm Sample 2-3 ml water add 0.5 ml HCL bubbles are observed in adulterated turmeric unadulterated No. Bubbles										

Table 1: Turmeric powder test result

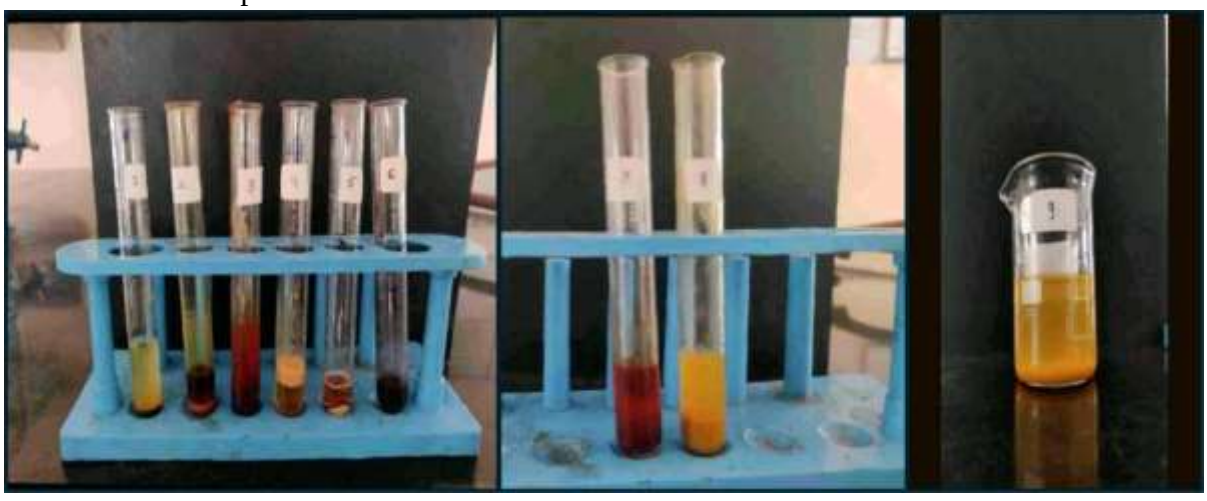


Figure 2:-Turmeric Powder Chemical Test Results

2.Edib1e oil: -

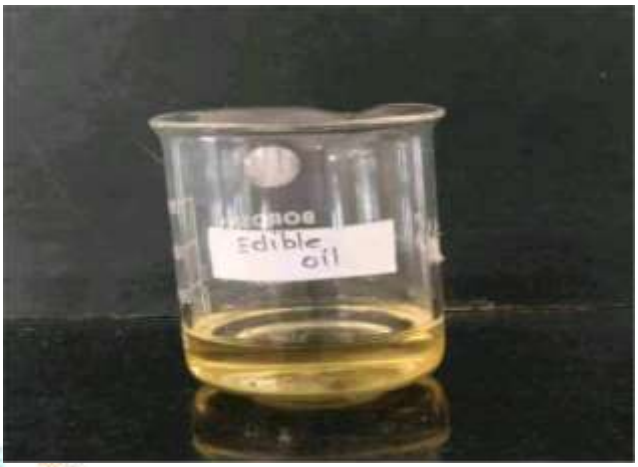


Figure 3 :- Edible Oil Sample

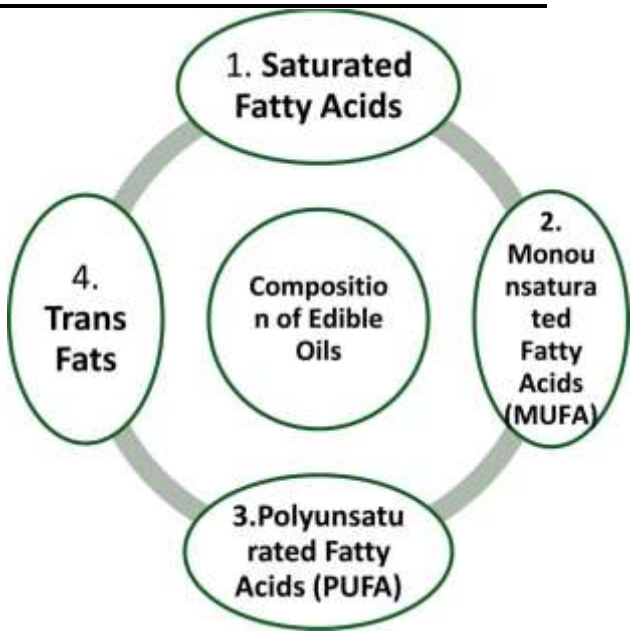
Introduction

Edible oil is a type of oil that is derived from plants, animals, or synthetic sources, used in cooking, baking, frying, and salad dressings. These oils are consumed daily in various forms and are essential to human nutrition. The global market for edible oil has expanded due to rising consumer demand for various types of oils with different health benefits and cooking qualities.

Types of Edible Oils

Edible oils can be broadly classified into two categories based on their origin: plantbased oils and animal-based oils. Each of these categories contains a wide range of oils used for culinary and nutritional purposes.

1. Plant-Based Oils	2. Animal-Based Oils	3. Other Oils
Vegetable Oils: Derived from seeds, nuts, fruits, these oils are commonly used in cooking. Examples include: Sunflower oil: Known for its high smoke point, ideal for frying and cooking. • Olive oil: A staple in Mediterranean diets, known for its heart-healthy monounsaturated fats. Canola oil: Low in saturated fats and commonly used for frying and baking. Soybean oil: Widely used in processed foods and frying due to its affordability. Coconut oil: Rich in saturated fats, it is used for frying and in many tropical cuisines. • Peanut oil: Preferred for deep frying due to its high smoke point.	Butter: Derived from milk fat, commonly used in baking and cooking. Lard: Fat derived from pigs, used in cooking and for flavor in many traditional dishes • Fish oil: Obtained from fish like cod, it is rich in omega-3 fatty acids and has nutritional benefits.	Palm oil: Derived from the fruit of the oil palm tree, palm oil is extensively used in cooking, especially in Africa and Southeast Asia.



Sample (Edible oil)										
Test	1	2	3	4	5	6	7	8	9	10
1.Test for argemone oil Mix 2ml of oil with 2ml of concentrated nitric acid shake well and let settle for a few minutes if a red orange color appears at bottom indicate adulteration										
2.Test for castor oil mix a small amount of oil with water in a glass container shake vigorously let it sit for if the mixture for thick, sticky layer it may indicate oil adulteration										

3.Detection of coloring agent mix Iml of oil with Iml of HCL few drop of H2S04 shake the mixture and let it set turbidity or insoluble layer indicate castor oil adulterant										

Table 2: - Edible oil test result

Figure 4:-Edible Oil Chemical Test Results

3.Ghee: —

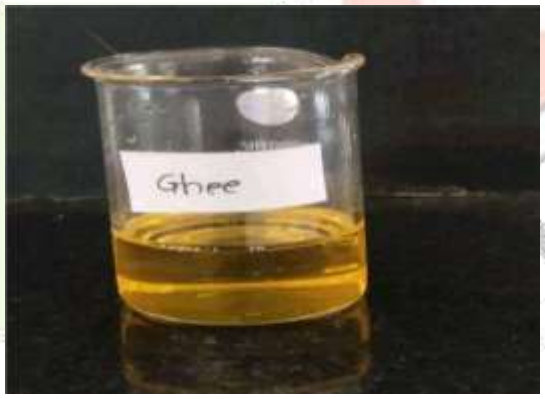


Figure 5 :- Ghee Sample

INTRODUCTION

Ghee, a type of clarified butter, has been a staple in South Asian cuisine for thousands of years. Known for its rich flavor and versatility, it is deeply embedded in the culinary traditions of India, Pakistan, Nepal, and surrounding regions. Ghee is produced by slowly melting butter to remove its water content and milk solids, leaving behind pure fat. In recent years, ghee has gained global recognition for its nutritional benefits and unique cooking properties. It is revered not only for its taste but also for its potential health advantages, particularly in traditional Ayurvedic medicine

Test	1	2	3	4	5	6	7	8	9	10
I.Ghee adulterated with coal tar dyes Take 2ml melted Sample in test tube add 5m1 conc.HCL shake well adulterated Sample change coloue crimson red										
2.Ghee adulterated edible fat take Iml melted Sample in test tube take Iml conc, HCL add half tea spoon of table sugar shake adulterated Sample changes acid layer colour to crimson red										
3.Ghee adulterated with the starch Melt the Sample in test tube add few drops of iodine blue or black colour indicate starch										

Table 3 :- Ghee test Result

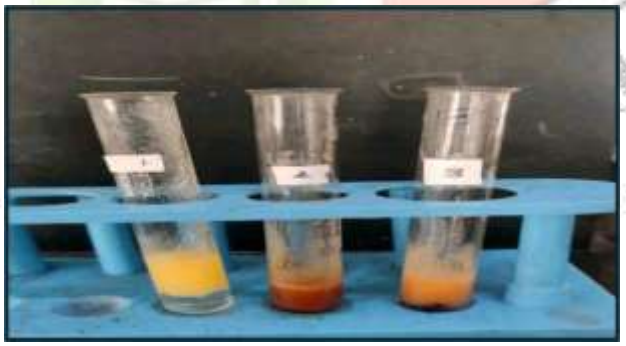


Figure 6 :- Ghee Chemical Test Results

4 Chilli powder: -

Figure 7:- Chilli Powder Sample

Composition of Chilli Powder

Chili powder is a complex mixture of various compounds that contribute to its flavor, heat, and health benefits. The exact composition of chili powder can vary depending on the type of chili pepper used, but it generally contains:

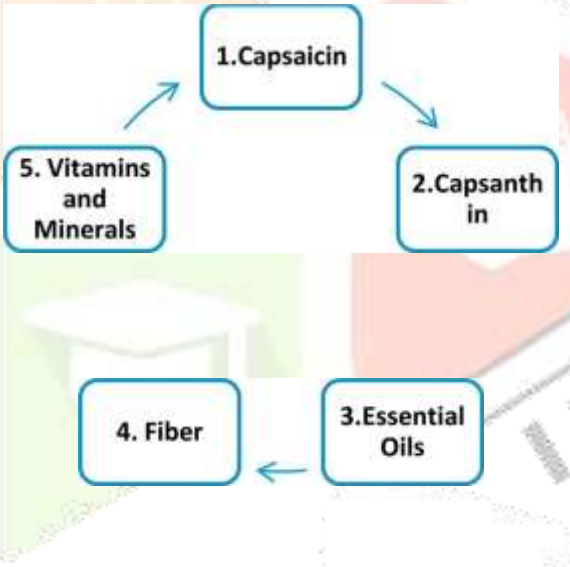


Figure 8:- Chilli powder Chemical test Result

Test	1	2	3	4	5	6	7	8	9	10
1 .Detecting artificial colour take a glass of water and sprinkle some Sample on its surface the adulterated Sample has colored streks which start descending in water immediatel										
2.Detection of Bricks /salt take a glass of water add a teaspoon of Sample to the glass now examine residue take a small quantity of residue and rub in your hand if any grittiness felt after rubbing the Sample is adulterated with brick										
3.Chi11i powder adulterated with Lead chromate 1 gm Sample adds Iml of concentrated HCI colour change to deep red in adulterated Sam le										

4.Metanil yellow test Dissolve the small sample of Sample in water add few drops of HCL and add a few drops of water to the mixture if the solution turns yellow or orange it indicate presence of yellow Colour										

Table 4: Chilli powder test result

5 Spices: -

Figure 9:- Spices Sample

Introduction

Spices have been an integral part of human culinary practices for thousands of years. Derived from various plant parts, such as seeds, bark, roots, flowers, or fruits, spices are used primarily for flavoring, coloring, and preserving food. Apart from their culinary significance, many spices have been valued for their medicinal properties, and they have played crucial roles in cultural, religious, and economic practices across the globe.

Test	1	2	3	4	5	6	7	8	9	10
1.Spices adulterated with sawdust take some powder spices and a glass of water s rinkle the										
powdered spices on the surface of the water the sample which is adulterated has traces of impurities on the surface of										

water										
2.Spices adulteration with starch take a sample of powdered spices in a Petri dish add 0.5ml of iodine solution to the spices in Petri dish sample adulterated blue colored chan e										

Table 5: Spices test Result

Figure 10:- Spices Chemical Test Result

6.Milk•. -

Figure 11:- Milk Sample

INTRODUCTION

Milk is a nutrient-rich liquid produced by mammals, offering essential vitamins, minerals, and proteins, making it a key part of human diets, especially in infancy. It has been consumed for thousands of years and is used in various processed forms like milk powder, yogurt, cheese, and butter. While considered a

cornerstone of healthy diets, its health benefits and potential drawbacks remain subjects of ongoing debate.

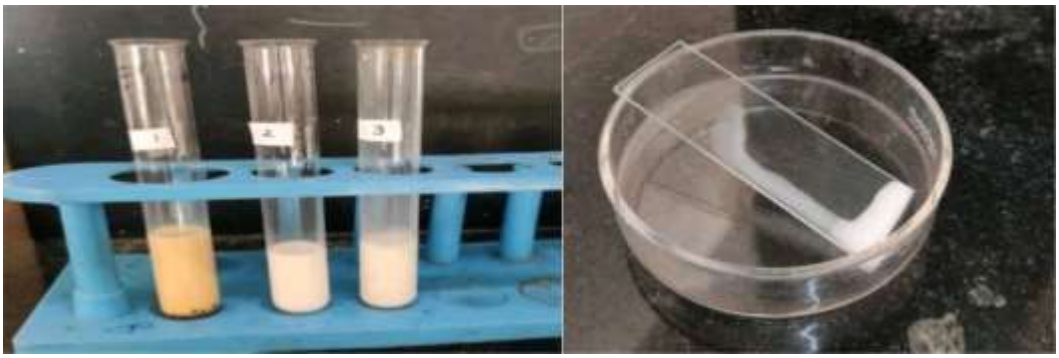


Figure 12:- Milk Chemical Test Result

Test	1	2	3	4	5	6	7	8	9	10
1.Take 5ml sample+add2ml Iodine Reagent mix and observe colour chan e										
2.Take 5ml Sample +shake content Vigorously bubble formation										
3.Take clean glass slide +slowly sample is pour vertically on a lass slide										

Table 6: Milk Test Result

ShAN:A revolutionary strip for Urea detection in milk

Procedure: -

Stepl: Take the organically grown soyabean (Glycine Max)

Step2: Grind the soyabeans into fine powder using a grinder or mortar and pestle

Step3: Prepare Soybean Paste: Make a paste by mixing soybean flour with water to form a smooth, thick consistency

Step4: Take the litmus paper and coat with a thin layer of soyabean paste

Step5: Dry the strip throughoutly

Ready to use: after drying the strip is ready for use as an adulteration detection tool

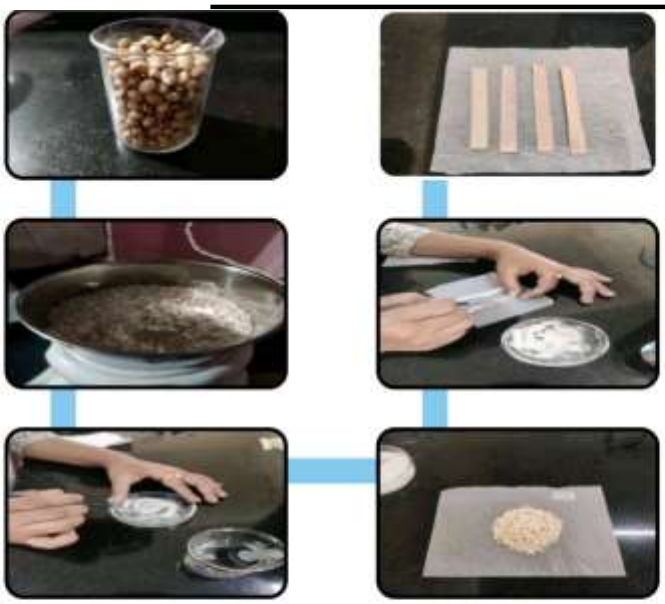
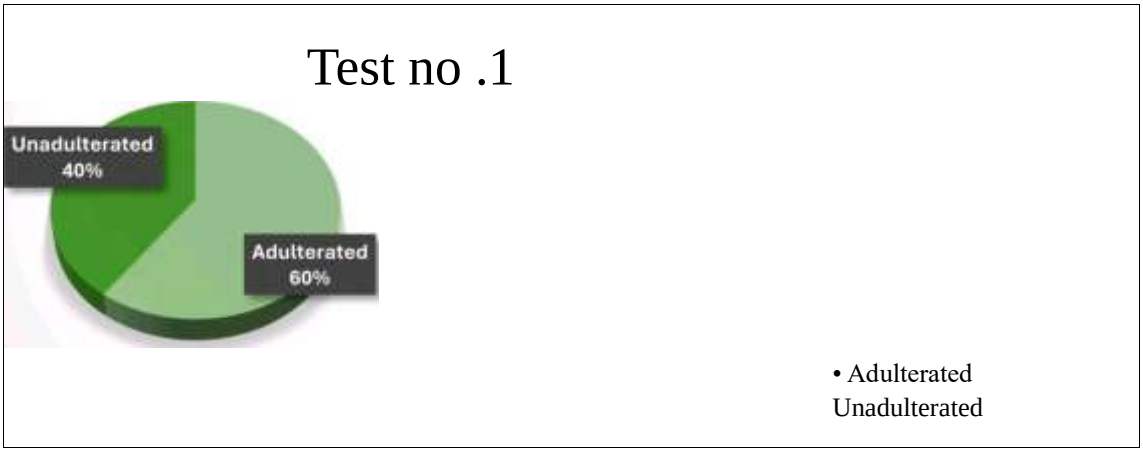


Figure 13:- Urea Detection Kit for Milk

ENSURE A HEALTHY FUTURE : REJECT ADULTERATION , EMBRANCE PURITY

Results: - Adulteration analysis of Turmeric powder sample



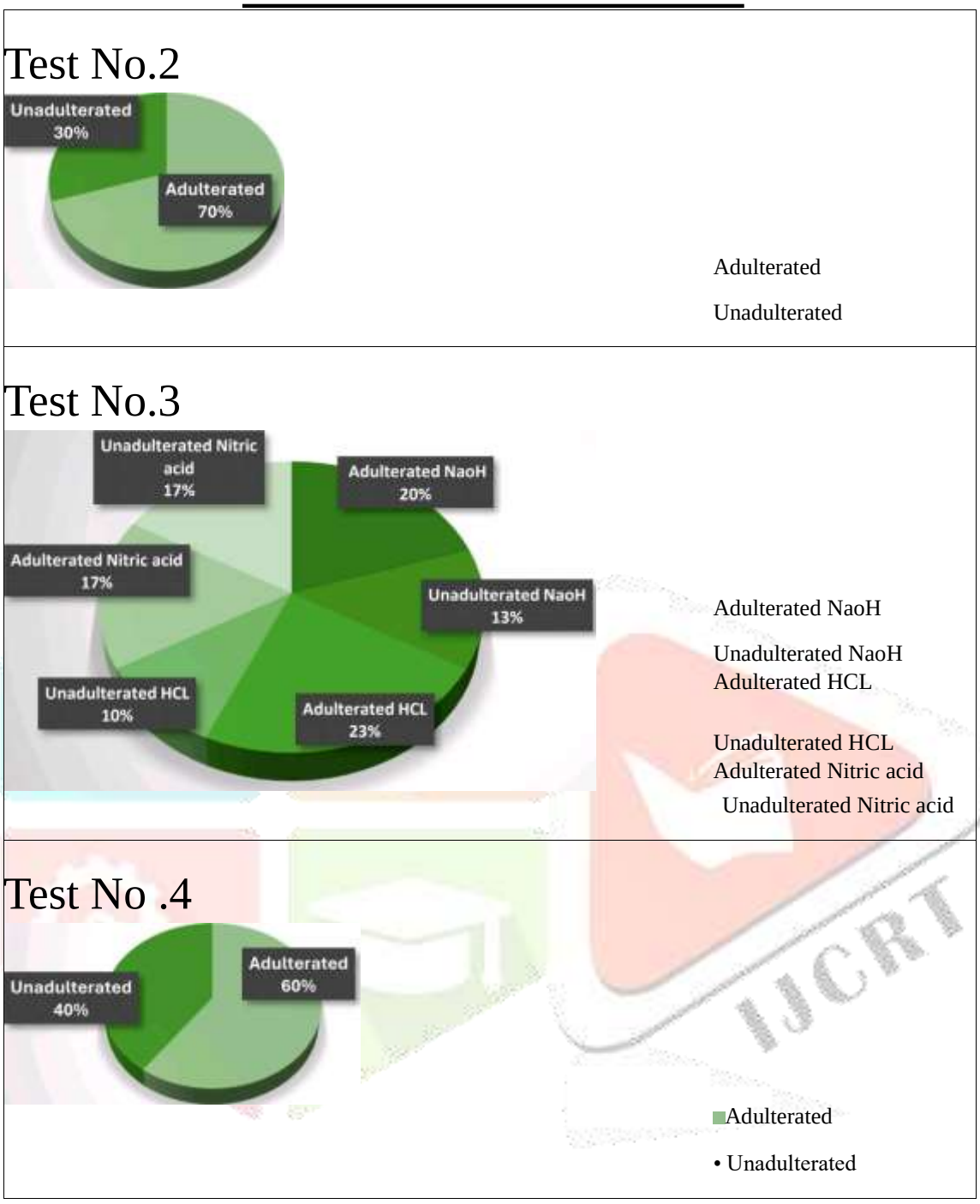
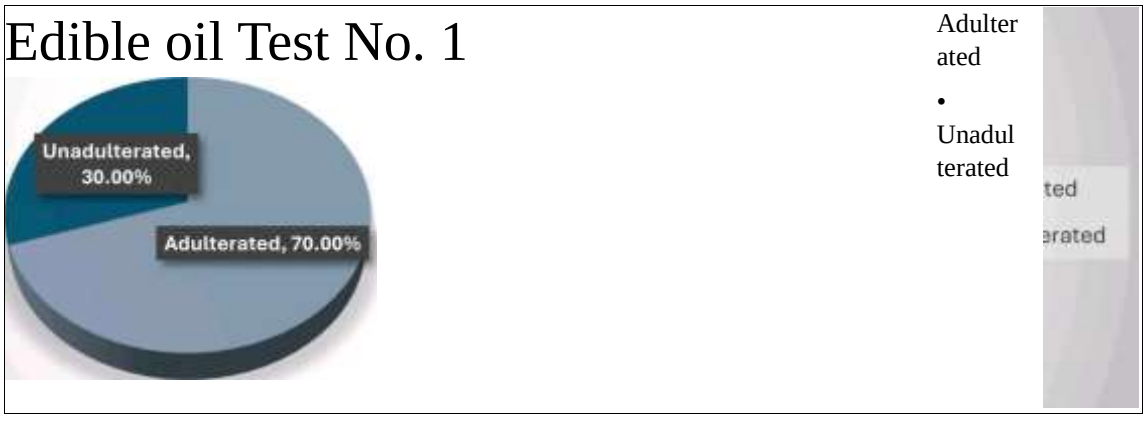


Figure 14:- Adulteration analysis of Turmeric powder sample

Adulteration analysis of Edible Oil sample



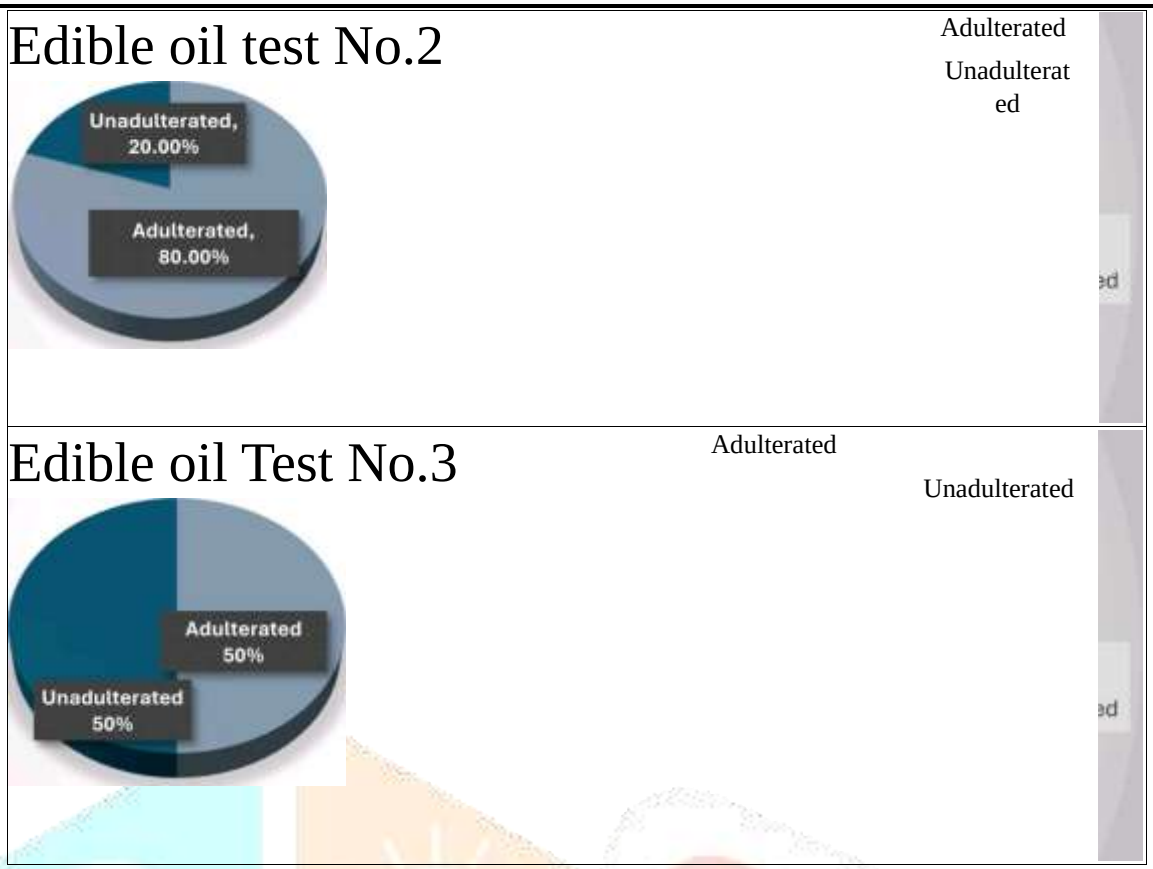
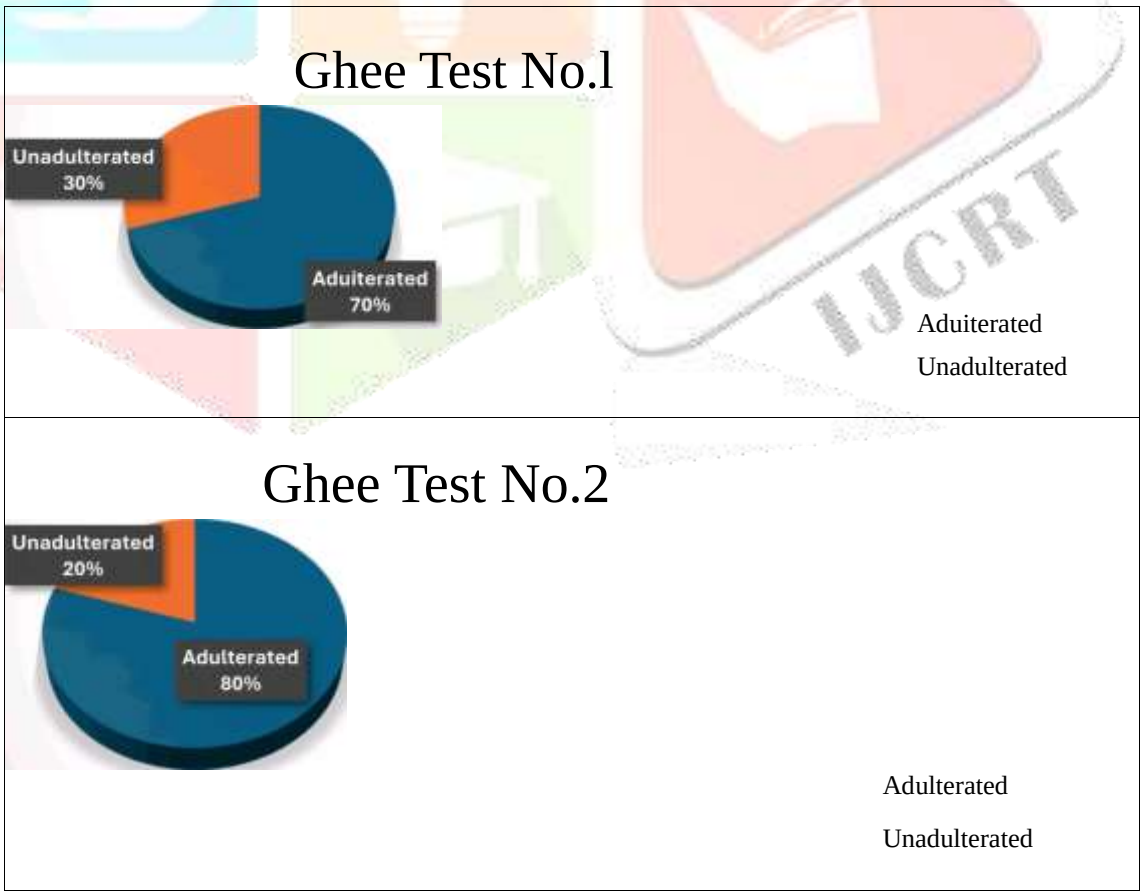


Figure 15 : Adulteration analysis of Edible Oil sample

Adulteration analysis of Ghee sample



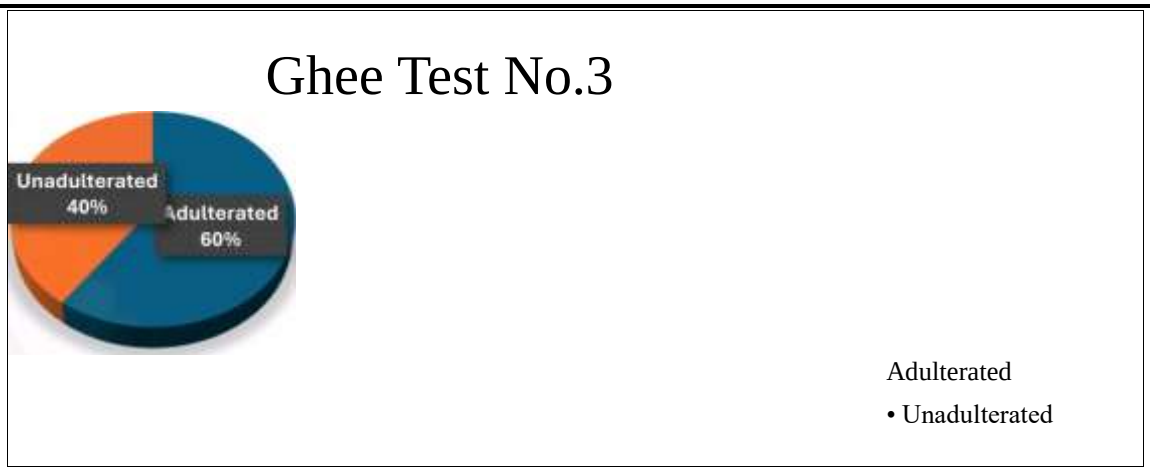


Figure 16 :Adulteration analysis of Ghee sample

Adulteration analysis of Chilli Powder sample

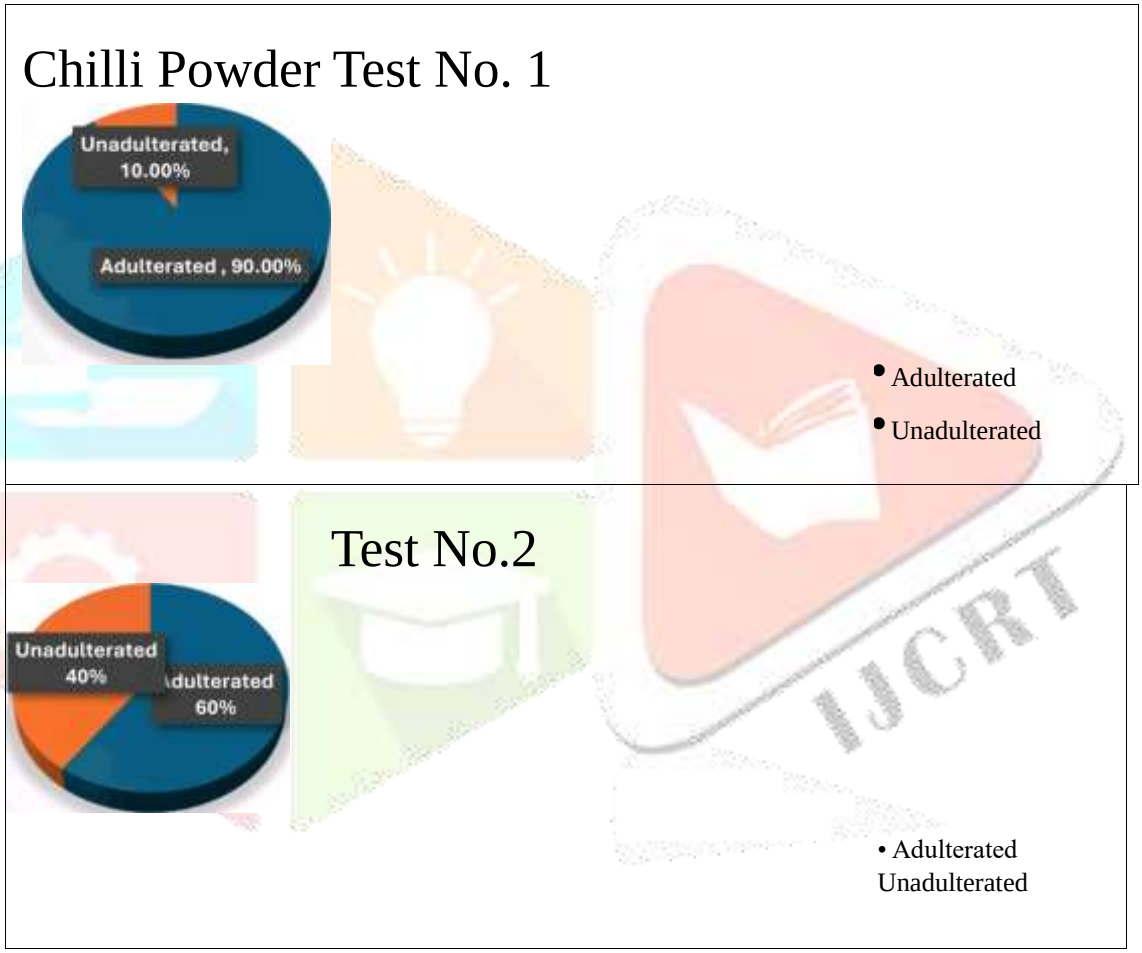


Figure 17 : Adulteration analysis of Chilli Powder sample

Adulteration analysis of Spices sample

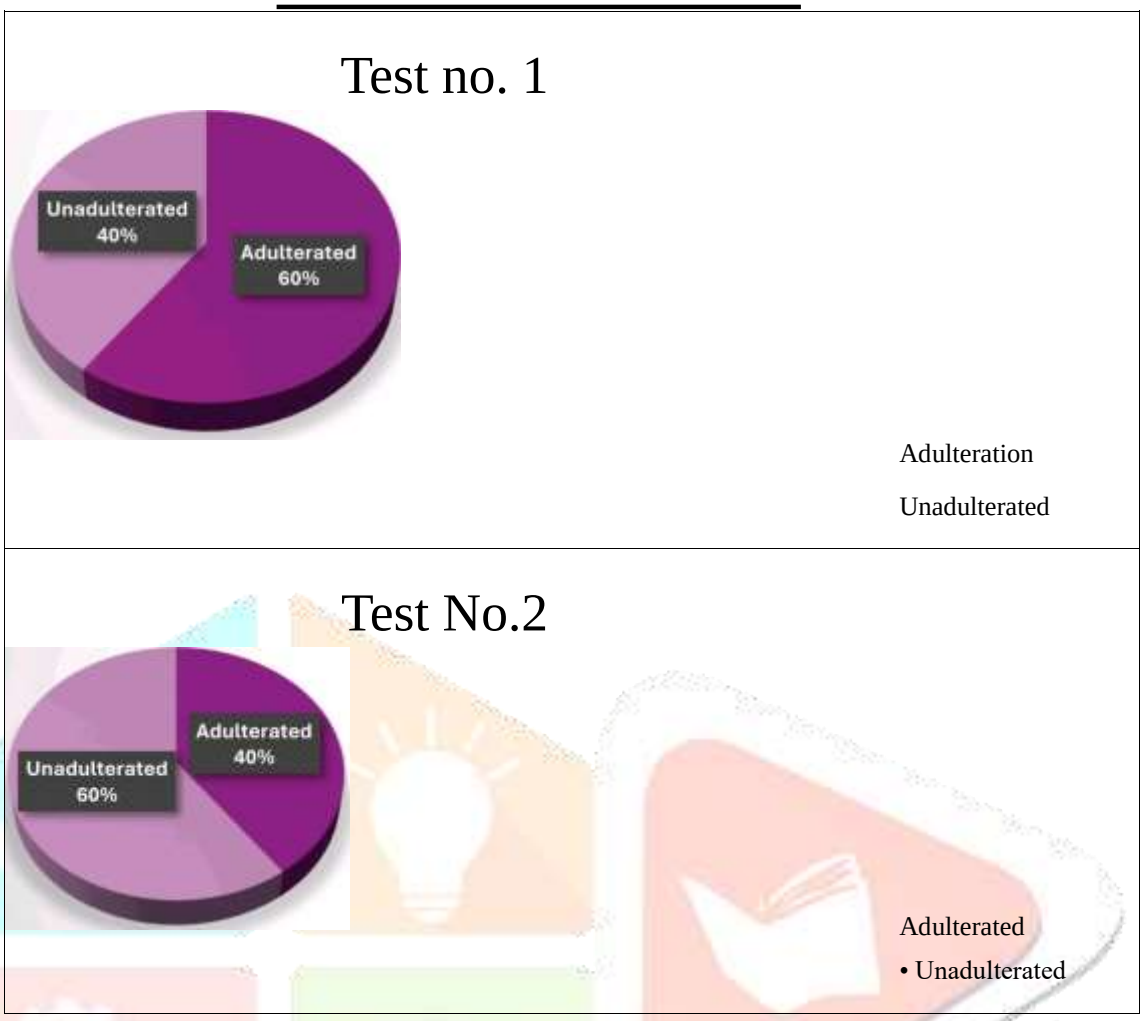


Figure 18:Adulteration analysis of Spices sample

Adulteration analysis of Milk sample

Figure 19:Adulteration analysis of Milk sample

: A revolutionary strip for Urea detection in milk

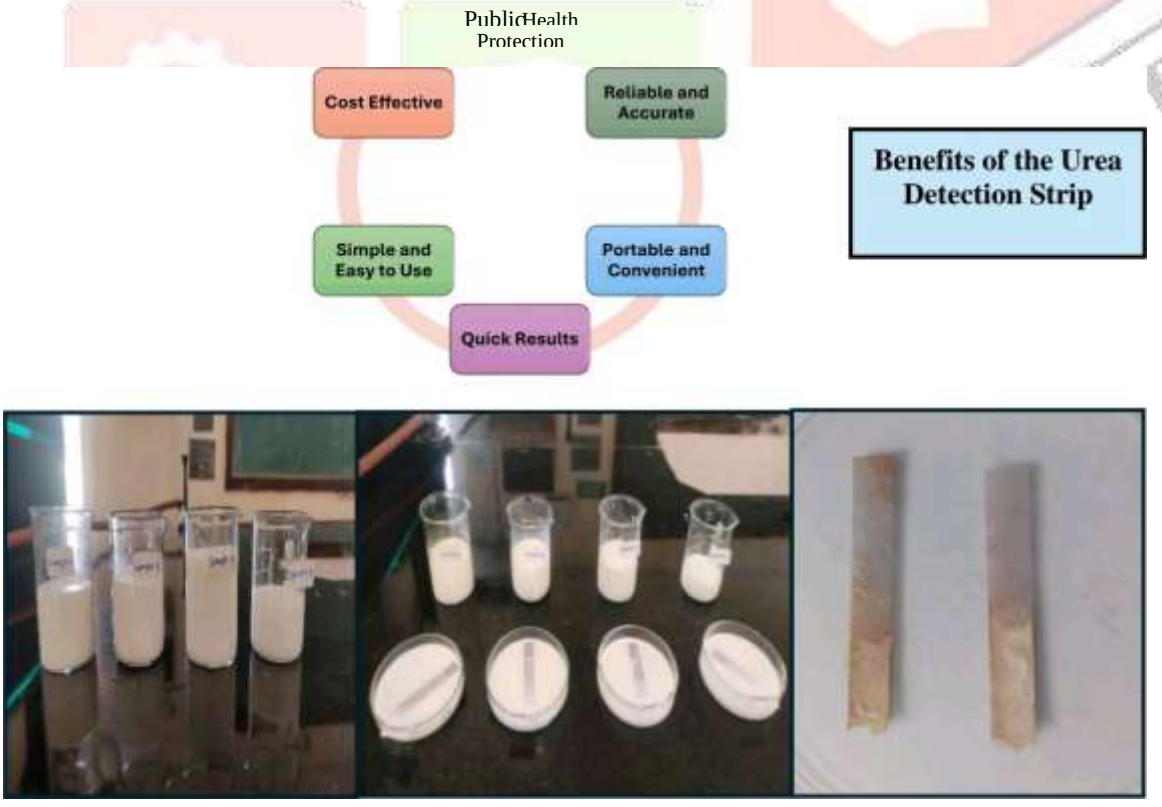


Figure 20 :- Cow's Milk Test Result

Mother Milk Test Result :

Figure 21 Mother Milk Test Result

The adulteration strip is used to detect the presence of urea in milk. When the strip is dipped into the milk, a color change occurs. If urea is present, the strip changes from red to blue, indicating the presence of urea in the milk.

• Why the colour change can occurs ?

Colour change from red to blue presence of ammonia commonly by product of urea breakdown so the presence of urea adulteration in milk leads to formation of ammonia which makes the litmus paper turn blue

Reaction

$$(NH2)2\ CO(urea) \qquad NH3\ (ammonia) + C02$$

CONCLUSION: -

The Urea Detection Strip represents a significant advancement in the fight against milk adulteration. Its simple design, affordability, and ease of use make it a practical tool for both consumers and professionals to detect urea contamination in milk. The strip's colour change from red to blue provides a clear and immediate visual indication of adulteration, ensuring quick and accurate detection. Moreover, the incorporation of soybean flour makes this method eco-friendly and sustainable in tackling food adulteration.

As part of our study, we examined 10 different food samples, including turmeric powder, edible oil, ghee, chili powder, spices, and milk, to evaluate adulteration levels. The findings confirmed the presence of significant amounts of adulterants, which can have harmful effects on consumer health. This underscores the urgent need for enhanced quality control measures and greater public awareness regarding food safety.

By further refining and widely implementing the Urea Detection Strip alongside other detection techniques, we can contribute to strengthening food safety standards across multiple industries. This will play a vital role in protecting public health, reducing the risks associated with adulterated food, and ensuring higher quality standards in the food sector.

BIBLIOGRAPHY

1. Biresaw, A. D. , Woldemariam, H. W. and Abera, B. D. , 2015. The Extent of Adulteration of Selected Foods at Bahir Dar, Ethiopia.pp. 1751-1764
2. Asrat, A. and Yilma, Z., 2014. Patterns of milk and milk products adulteration in Boditti town and its surrounding, South Ethiopia. J Agric Sci, 4 (10), pp. 512-6
3. Food safety & standards authority of india (FSSAI), 2010 (ministry of health & family welfare) fda bhavan, kotla road, new delhi — 110 002 website: www.fssai.gov.in
4. Deepti Narayan, 2014, Food adulteration-Types, worldwide lows and future Category: Healthcare Views: 20277
5. El-Loly, M., Mansour, A. 1. A. and Ahmed, R. O., 2013. Evaluation of Raw Milk for Common Commercial Additives and Heat Treatments. Internet Journal of Food Safety, 15: 7-10.
6. Maurizio, A. Beitra "ge zur Quantitativen Pollenanalyse des Honigs. 3. Absoluter Gehalt Pflanzlicher Bestandteile in Espar sette, Luzerne, Orangen und Rasphonigen. Ann. Abeille 1958, 11,93-106.
7. Maurizio, A.; Louveaux, J. Pollens des plantes Melliffe A res d'Europe; Union des Groupements Apicoles Francsais, 1965.pp.50-56
8. F Harding. Adulteration of milk, Milk Quality: Food Science Book, in: F. Harding (Ed.), Chapman and Hall, New York, 1999.
9. CC Fertig•, F Podczeck•, RD Jee•, MR Smith; Eur. J. Pharm. Sci, 2004, 2, 155.
10. W Banks; CT GreenwooD•, DD. Muir. Starch/Starke, 23
11. ACA Veloso; N Teixeira; IMPLVO Ferreira; MA Ferreira. Quim.nova, 2002, 25, 609.
12. IMPLVO Ferreira; MBPP Oliveira. J. Liq. Chromatogr. Relat. Tech-nol, 2003, 26, 99.
13. R Lopez-Fandino; N Corzo; M Villamiel•, T Delgado; A Olano•, M Ramos. J. Food Protect, 1993, 56, 263.
14. Preethi P J, Padmini, K, Lohitha, M, Swetha, K, Priyanka K & Rao V P 2014 Adulterants and substitutes of foods and herbs: A review. Int. J. Med. Chem. Anal. 4: 213-217.
15. Bharathi S K V, Sukitha A, Moses J A & Anandharamakrishnan C 2018 Instrument - based detectin methods for adulteration in spice and spice products- A review. J. Spices Arom. Crops 27: 106-118.
16. Zhao Z, Hu Y, Liang Z, Yuan J P, Jiang Z & Leung K S 2006 Authentication is fundamental for standardization of Chinese medicines. Planta Med. 72: 865—874
17. Cheng Y, Dong Y, Wu J, Yang X, Bai H, Zheng H et al. Screening melamine adulterant in milk powder with laser Raman spectrometry. J Food Composit Anal. 2010;23(2):19
18. Shrishti Nirwal, Rakesh Pant and Nishant Rai. Analysis of Milk Quality, Adulteration and Mastitis in Milk Samples Collected from Different Regions of Dehradun. International Journal of Pharm Tech Research. 2013; 5(2):359-364.

19. Das S, Goswami B, Biswass K. Milk Adulteration and Detection A Review. Sensor Letters. 2016; 14:4-18
20. Dhanapal, G., & Banu, S. (2017). A simple method for the detection of urea in milk using a qualitative test. Journal of Food Science and Technology, 54(5), 1356-1361.
21. Patel, R. K., & Sinha, A. (2019). Detection of urea in milk: A review of techniques and recent advances. Journal of Dairy Science & Technology, 67(2), 74-81.
22. Sharma, R. K., & Yadav, A. K. (2018). Development of a strip test for the detection of urea adulteration in milk. Food Control, 89, 72-77
23. Das, P., & Sahoo, S. (2012). "Detection of adulteration in milk: A review." International Journal of Food Science & Technology, 47(2), 249-257.
24. Laura Schumm, 2014 Food Fraud: A Brief History of the Adulteration of Food 48(2)
25. Cordella, C., Moussa, 1., Martel, A. C., Sbirrazzuoli, N. and Lizzani-Cuvelier, L., 2002. Recent developments in food characterization and adulteration detection: technique-oriented perspectives. Journal of agricultural and food chemistry, 50 (7), pp. 1751-1764