iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** XII **Month of publication:** December 2025

DOI: https://doi.org/10.22214/ijraset.2025.76305

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue XII Dec 2025- Available at www.ijraset.com

A Review Paper on Food Adulteration

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Abstract: ***Food is essential for our survival, and we expect it to be pure, safe, and nutritious. However, in today's world, food adulteration has become a serious problem. Adulteration means adding harmful or low-quality substances to food, which reduces its quality and can even harm our health. From milk and spices to oils and sweets, many everyday food items are often mixed with chemicals, colors, or cheaper ingredients. This not only cheats consumers but also poses major health risks. Understanding food adulteration, its types, causes, and prevention is important to ensure the food we eat is safe and healthy.***
Keywords: Adulterant, Common Adulterated Foods, Examples of Common Adulterants ,Causes of Food Adulteration, Effects on Health, Detection of Food Adulteration (Simple Tests), Prevention & Control, Government Role / Laws,Consumer Rights.

I. INTRODUCTION

Food Adulteration is a curse for mankind. It has been happening since times immemorial and continuing in the recent times. To control such problems, various technologies have been developed. In the present work, the detection methods of food adulteration are reviewed with a focus on detection of common food adulterants.

Detection of adulteration in food is an essential requirement for ensuring safety of foods we consume. Although sophisticated lab techniques are accurate, precise, and reliable, yet they are costly and time consuming.

It is essential to develop reliable "quick screening tests" which a common person can perform at the level of household so as to have a broad picture of status of adulteration in his food in case of doubt.

Food adulteration occurs globally and in many facets and affects almost all food commodities. Adulteration not only constitutes a considerable economic problem but also may lead to serious health issues for consumers.

Recent applications in food authenticity control are presented. As studies indicate that adulteration is even increasing, it is concluded that more research efforts need to be made to protect consumers from health risks and honest producers from economic loss.

Food adulteration is an evolving concept due to increased detection methods for contaminants as well as the growing opportunity for fraudsters to profit from the acts .

The food adulteration risks are being considered from sources across the food protection spectrum including food quality, food safety, food fraud, and food defense. Any food product that is a public health threat is classified as the effect of adulteration though there may be many different types of causes or motivations. Food fraud is a broader term that includes the cause of motivation of the incident. To stay ahead of the growing scope, scale, and threat, new countermeasure approaches are being developed to more efficiently and effectively detect and deter.

Food adulteration refers to the practice of degrading the quality of food by adding unwanted, inferior, or even harmful substances. It also includes removing valuable components from food or misrepresenting a product to make it seem better than it is. Adulteration can happen anywhere in the food chain—from production and processing to packaging and distribution.

A. Why It Happens

The main driver behind food adulteration is economic gain. By substituting cheaper materials, increasing bulk with fillers, or adding artificial colors to enhance appearance, sellers can increase profits. However, adulteration may also happen unintentionally due to poor hygiene practices, improper storage, environmental contamination, or lack of awareness among handlers.

B. Types of Adulteration

Intentional adulteration

Deliberate addition of cheap or harmful substances

Examples: Mixing water in milk, adding artificial dyes to spices, blending low-grade oils with pure oils

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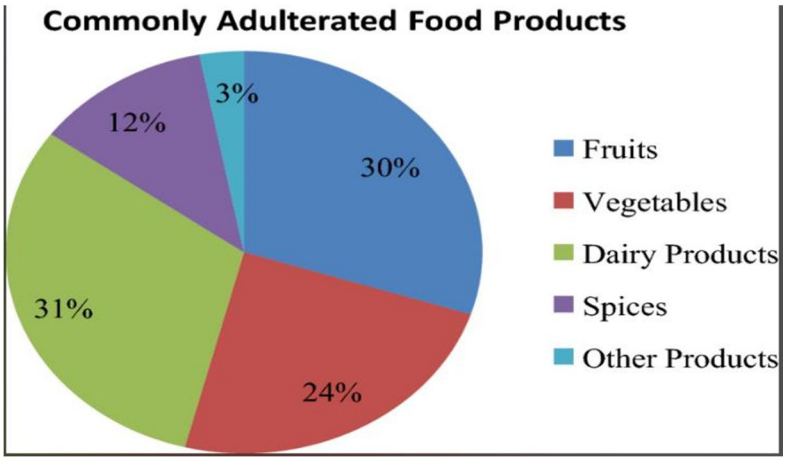


Fig 1: Adulteration of food in India

C. Unintentional adulteration

Replacing a high-value ingredient with a cheaper one
Example: Replacing pure honey with corn syrup

D. Concealment

Using substances to hide spoilageOlive oil blended with cheaper refined oils
Ghee mixed with vanaspati
Honey adulterated with sugar syrups
Health Risks
Food adulteration can range from mildly harmful to extremely dangerous. Its effects may includeOccurs accidentally due to contamination or negligence
Examples: Insect parts, pesticide residues, metal particles from machinery
Example: Adding colors to stale vegetables to make them look fresh

E. Common Examples Found in Daily Life

Milk diluted with water
Turmeric mixed with metanil yellow
Chili powder mixed with brick powder
Digestive issues
Allergies or toxic reactions
Damage to organs (liver, kidneys)
Increased risk of long-term diseases, including cancer (from certain eyes and chemicals)

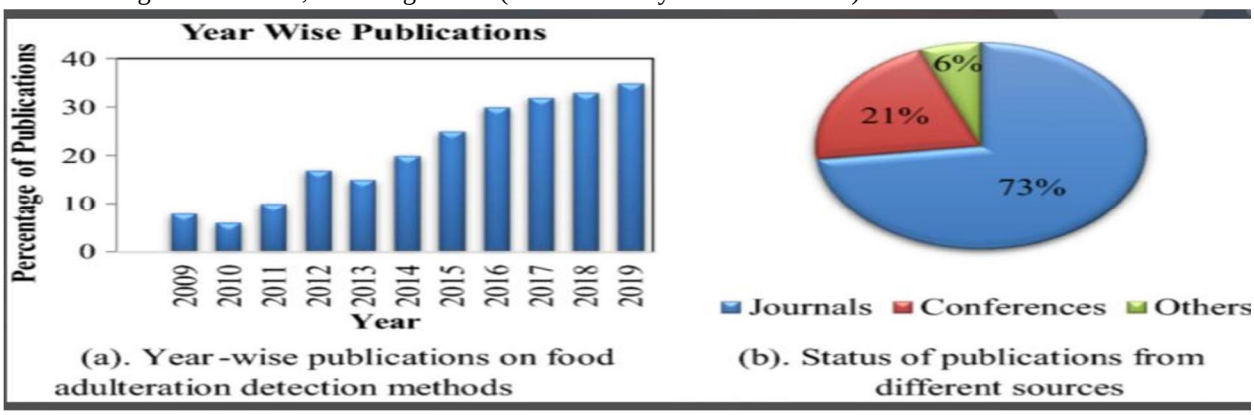


Fig 2: Year wise food adulteration detection methods

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue XII Dec 2025- Available at www.ijraset.com

F. Detection and Prevention

Governments enforce standards through agencies like FSSAI and conduct regular food sampling. At home, simple tests—such as solubility, color changes, or sediment observation—c bhan help detect basic adulterants. More complex cases require laboratory analysis, especially for chemical or molecular adulterants.

G. Why It Matters

Food adulteration threatens public health, consumer trust, and fair trade. Ensuring food purity is essential for a healthy society, and awareness among consumers is one of the strongest ways to fight it.

Table 6.2 Food Adulterants and its harmful effects.

S.No.	Food group	Adulterant	Harmful effects on health
1.	Cereals, wheat and other food grains	Ergot	Nausea, vomiting, Gastric pain burning sensation in extremities
2.	Pulses and legumes Dhal	Kesari Dhal and toxic dyes	Leads to lathryism.
3.	Milk and milk products Milk, Khoa, Bura cheese	Starch	Diarrhoea and vomiting
4.	Sugar and Jaggery	Washing soda	Diarrhoea, vomiting
	Honey	Invert sugar	Nausea, vomiting
	Jaggery	Washing soda Chalk powder	Diarrhoea, vomiting
5.	Edible oils and fats	Argemone oil Mineral oil Karanja oil Castor oil	Gastric problems, carcinogenic, skin problems
	Ghee & butter	Vanaspati Mashed potatoes and starches	Flatulence, gastric problems
6.	Spices & condiments Turmeric powder	Yellow aniline dyes. Non permitted colorants like metanil yellow	Causes giddiness, weakness, cyanosis, vomiting and are carcinogenic
	Chilli powder	Brick powder	Leads to gastric pain, cholic pain and indigestion

Table 1: Food Adulterants and its harmful effects

II. METHODOLOGY

A. Paneer

Take a small quantity of the paneer sample. For a more reliable test boil the paneer sample first.

1) Procedure:

- Boil the paneer piece in 2-3 ml of water for a few minutes.
- Cool the sample to room temperature.
- Crush the paneer into a soft paste for better contact with the iodine.\

2) Result:

- A blue-black color if it is adulterated with starch, and no color change if it is pure
- Pure paneer, made from milk proteins, does not contain starch, so it will not react with iodine. Adulterated paneer, often made with added starch for a lower cost, turns blue or black when iodine is added to the sample.

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Fig 3: Paneer Adulteration using Iodine

B. Honey

Take 2-3 spoon of Honey Sample.

1) Procedure

- Obtain a tissue or blotting paper: Use a piece of absorbent paper, like a napkin, paper towel, or a blotting paper.
- Apply a few drops of honey: Dribble a few drops of the honey you wish to test onto the paper.
- Observe the results:
- Pure honey is thick
- It will remain on the surface without being absorbed, whereas adulterated honey (containing added water or syrups) will soak into the paper and leave a wet mark.
- and will sit on the surface of the paper without being easily absorbed. It may leave at most a very minor damp mark
- Adulterated honey (containing added water or sugar solutions) is less viscous and will be absorbed by the paper, often leaving a wet mark or flowing through it.



PURE *IMPURE*

Fig 4: Honey Adulteration using Tissue paper

C. Cheese

Take a piece of cheese.

1) Procedure:

- Take a piece of cheese
- Boil the cheese in the container
- Put 2-3 drops of iodine on cheese

2) Result:

- Pure cheese: colour of cheese does not change
- Impure cheese: colour changes into black blue



PURE IMPURE

Fig 5: Cheese Adulteration using Iodine

D. Turmeric

Turmeric samples (branded + loose/unknown)

1) Procedure:

- White blotting paper or plain filter paper / absorbent paper (cut into strips).
- Small glass beakers / test tubes
- Distilled or clean warm water
- Vinegar (acetic acid) or dilute HCl (only if trained/authorized)
- Dropper / pipette
- Small spoon / spatula

2) Result:

- Adding diluted hydrochloric acid (Dil. HCl) to a turmeric sample helps detect the presence of two common adulterants: chalk powder (calcium carbonate) and Metanil Yellow.



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Fig 6: Turmeric Adulteration using Dil. HCl

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E. Fruit Juice

Pour about 20–30 ml of the juice into a small glass bowl.

1) Procedure:

- If the juice is very thick, add a little clean water and mix.
- Take a small piece of white cotton wool.
- Dip it into the juice and let it soak for 1 minute.
- Add Dilute HCl
- Remove excess juice by pressing gently.
- Place the wet cotton on a plate.
- Add 3–5 drops of dilute HCl directly onto the soaked cotton using a dropper.

2) Result:

- Cotton turns bright red / pink / orange / yellow instantly
- Cotton remains white or slightly stained with natural juice pigment

3) Image:



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Fig 7: Paneer Adulteration using Iodine

III. ACKNOWLEDGEMENT

I extend my heartfelt gratitude to the assistance, suggestions, and encouragement provided by my mentors. Their contributions have significantly strengthened the quality of this manuscript.

I am thankful to the pimpri chinchwad college of engineering, AS&H department for provision of required chemicals and lab for experimental work and for their timely help and technical support. My sincere thanks also go to my peers for their valuable inputs and constructive discussions.

REFERENCES

[1] Danliangmin Song , Kai Dong , Shiyu Liu , Shiqian Fu , Feng Zhao , Chaoxin Man b, Yujun Jian, Kuangyu Zhao Bo Qu , Xinyan Yang, Research advances in detection of food adulteration and application of MALDI-TOF MS: A review, Science Direct, Food Chemistry, Volume 456, 30 October 2024, 140070

[2] Ali Sadeghi a, Shokoofeh Khani a, Reyhaneh Sabourian b, Mannan Hajimahmoodi b, Jahan B. Ghasemi a Integrating CNNs and chemometrics for analyzing NIR spectra and RGB images in turmeric adulterant detection, Journal of food composition and analysis, Science Direct , Volume 141, May 2025, 107324

[3] T. Vignesh, D.Selvakumar, R. Jayavel . Multi-Spectral techniques for detecting adulterants in turmeric powder . Microchemical Journal Science Direct , Volume 209, February 2025, 112830

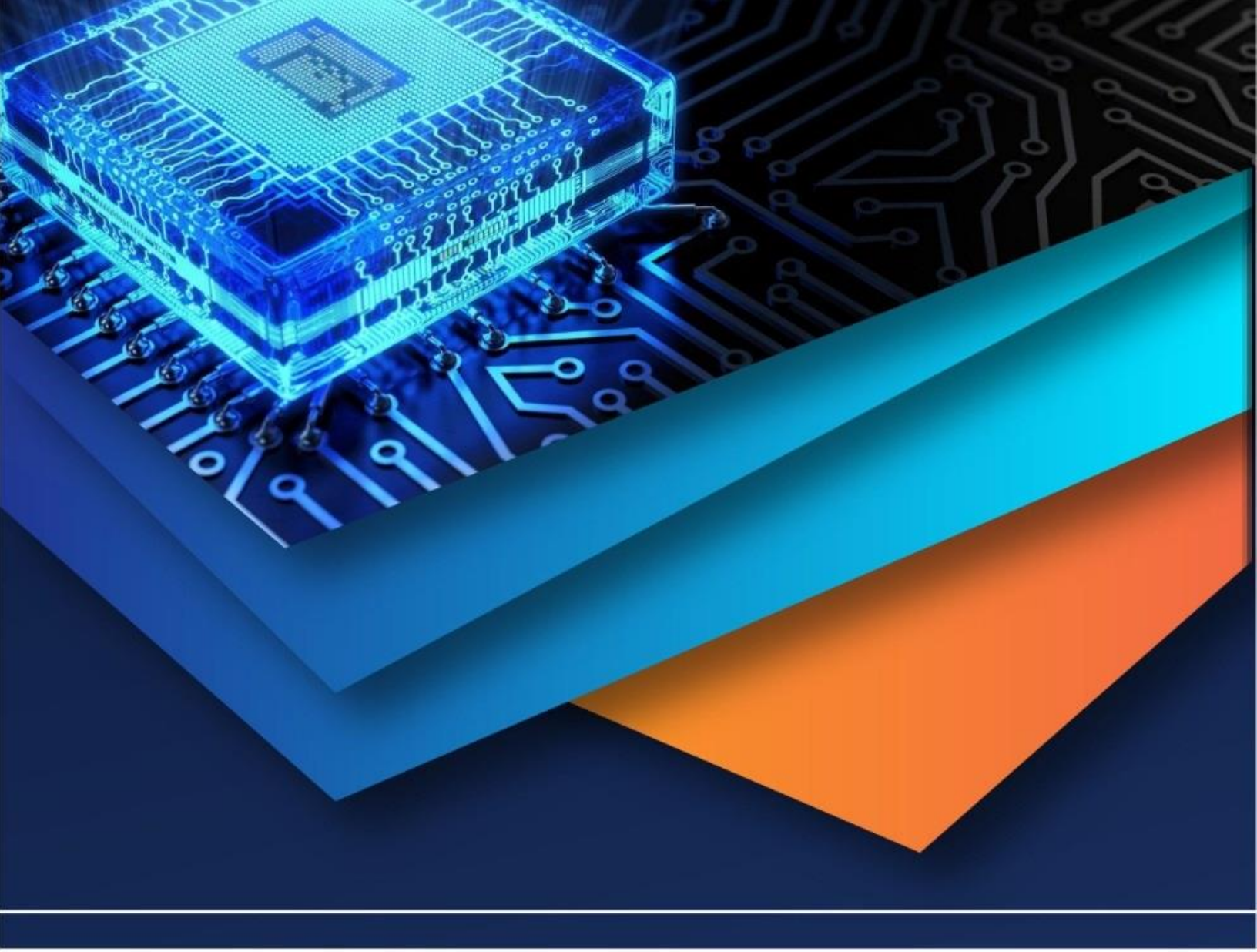
[4] Rui Xu , Muhammad Zeeshan Adil , Sidra Jabeen , Khansae, Mahwish Tanveer , Sadia Younis , Bakhtawar Shafique , Long Li. . ..Recent advancements in chemometrics based non-destructive analytical techniques for rapid detection of adulterants in milk and dairy products. Food Control Science Direct , Volume 174, August 2025, 111247

[5] Rohit Rai a, Rohit Bharti b, Prodyut Dhar Biodegradable , water-resistant, smart cellulose-based drinking straws from agricultural biomass with detection of adulterants in beverages Science Direct ,Volume 474, 15 May 2025, 143093

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[6] Arunkumar Elumalai , Venkatachalapathy Natarajan .Advancements in analytical technologies for ensuring food quality and authentication: A comprehensive review.Journal of food composition and analysis, Science Direct ,Volume 139, March 2025, 107075
[7] T. Vignesh, D.Selvakumar, R. Jayavel Detecting ferric oxide adulteration in chilli Powder: A Multimodal analytical approach for enhanced food safety Microchemical Journal Science Direct ,Volume 208, January 2025, 112332
[8] Huihui Yang a, Yutang Wang a b, Jinyong Zhao a, Ping Li a, Zhixiang Li a, Long Li a, Bei Fan a, Fengzhong Wang . Data-driven pipeline modeling for predicting unknown protein adulteration in dairy products. Food Chemistry Science Direct ,Volume 471, 15 April 2025, 142736
[9] Ahmed S. El-tahlawy a b, Abdullah S. Alawam c, Hassan A. Rudayn c, Ahmed A. Allam c, Rehab Mahmoud d, Hany Abd El-Raheem e, Waleed Alahma . Advanced analytical and digital approaches for proactive detection of food fraud as an emerging contaminant threat , Talanta open Science Direct ,Volume 12, December 2025, 100499
[10] Xavier Marín a, Eduard Grau-Noguer b c, Guillem Gervilla-Cantero d, Carolina Ripolles-Avila d, Manuel Castillo .Emerging technologies for detecting food fraud: A review of the current landscape in the 2020s . Trends in food science and technology Science Direct Volume 165, November 2025, 105313
[11] Jialing Liu,Jian Sun,Huan Wei,Hong Yu,Xiangdong Dai,Qing Hu Isolation and characterization of a novel tadalafil analogue adulterant, N-cyclohexyl nortadalafil, in a dietary supplement Journal of Pharmaceutical and Biomedical Analysis Science Direct , Volume 227, 1 April 2023, 115144
[12] Sanjeev Kumar Sharma , Davinder Pal Singh Oberoi 1Assessment of physicochemical, microbiological and quality characteristics of raw standardized milk in northern part of India Journal of Diary Science,4 December 2025
[13] Kh Zulfikar Hossain ,Jianhong Xue Consumers' food safety risk perception of liquid milk: Empirical evidence from Dhaka city of Bangladesh,Food and humanities, science direct Volume 4, May 2025, 100536
[14] Lahcen Hssaini , Said Ennahli ,Preprocessing-dependent machine learning models enhance mid-FTIR detection of honey adulteration,Journal of food composition and analysis Science Direct Volume 148, Part 5, December 2025, 108666
[15] Fatma Nur Arslan , Gönül Akin , Şükriye Nihan Karuk Elmas , Ibrahim Yilmaz , Hans-Gerd Janssen , e study of ATR–FTIR spectroscopy and synchronous fluorescence with multivariate data analysisAdnan Kenar Rapid detection of authenticity and adulteration of cold pressed black cumin seed oil: A comparative,Food Control,ScienceDirect,Volume 98, April 2019.
[16] Thakur Prava Jyoti , Susmita Mitra , Shivani Chandel , Rajveer Singh,Essentials of qNMR: Navigating adulteration and quality control challenges across food, herbal medicines and beyond,Pharmacological Research - natural products,ScienceDirect Volume 9, December 2025, 100429
[17] Dilpreet Singh Brar, Birmohan Singh , Vikas Nanda,Deep Neural Networks for Adulteration Detection in Red Chilli Powder: A Pillar for Food Quality,Journal of Future Foods,ScienceDirect,Available online 10 July 2025.

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