



# A STUDY ON THE ADULTERATION OF SELECTED FOOD ITEMS FROM DIFFERENT AREAS OF KURNOOL CITY

Dr. Nabiya sultana Mayana

Department of Chemistry

Dr. Abdul Haq Urdu University, Kurnool-518001, India.

**Abstract:** In this contemporary time of globalization, India is rising rapidly in almost all areas, but at the same time, one of the most significant issues that needs more attention is food safety, because food adulteration has become a major problem in our society. This paper presents a detailed study of common food adulterants in food as well as different methods to detect the adulterants. It also provides information about the types of adulterants, the reasons for adulteration, and the impact of adulterants.

**Index items** - Food adulteration, Types of food adulteration, Harmful effects.

## I. INTRODUCTION

Food adulteration in India is getting noxious day by day. Food adulteration is detrimental to human beings, so it is considered a crime. In spite of stringent measures against adulteration, it is still done just for profit, putting human lives at risk <sup>[1, 2]</sup>. Food adulteration may be intentional, incidental, or caused by contamination with foreign materials such as metals. Starting from infants to the elderly, there are lots of health risks seen with food adulteration, such as various stomach disorders, small intestine problems, nausea, vomiting, food poisoning, cardiac disorders, kidney problems, liver problems, appendicitis, delay in brain development in children, carcinogenic effects, etc. <sup>[3]</sup>. This study endeavoured to bring awareness to the public on the significant subject of food adulteration, and several simple methods are available to detect food adulteration <sup>[4]</sup>.

### Types of food adulteration <sup>[5]</sup>

Food adulteration is the procedure by which the value of the food or its products is abridged through the accumulation of an alien or inferior substance or the elimination of a vital element.

There are four different types of food adulteration.

#### 1. Intentional adulteration

When materials that look similar to the constituents of the food are added to it, it will increase its weight and gain more profit.

e.g., mixing of pebbles, stones, marbles, sand, mud, filth, chalk powder, contaminated water, etc.

#### 2. Incidental adulteration

Incidental adulteration happens due to carelessness while handling food. Like residues of pesticides in grains, larvae growth, the presence of droppings of rodents, etc.

### 3. Metallic adulteration

Metallic adulteration is the introduction of metallic materials into food, such as lead or mercury. It may occur accidentally or even intentionally.

### 4. Packaging hazard

The packing substances in which the food is packed may also interfere and mix with the constituents of the food, leading to packaging hazards.

## II. MATERIALS AND METHODS

In this study, food samples were collected from various wholesale and retail shops in Kurnool city. Different food products were selected for evaluating food adulteration <sup>[6]</sup>.

These tests were performed in the laboratory by different physico-chemical methods. Each food item in the food cluster was examined for various adulterants. The below table shows the food stuffs tested in each food cluster.

S.No.	Food cluster	Food stuffs	Sample collection area
1.	Milk	Milk	Near jamia masjid, king market, Marwari Street, Kurnool city.
2.	Spices and condiments	Chilli powder, Cumin seeds, Turmeric powder, Mustard seeds and Black pepper	Choti market, badibeedh, Kurnool city.
3.	Sweetening agents	Sugar, Jaggery and Honey	Chowk bazar road, Near grand hotel, Bongul bazar, Chatri Bagh, Kurnool city.
4.	Fats and oils	Ghee, edible oil and coconut oil	Pinjarwadi street, Bada Padakhana, Kurnool city.
5.	Grains and their products	Rice, Bajra, Sago, Pulses, Wheat flour and Besan or gram flour	Mandi bazar, Nehru Road, Main bazar, Kurnool city.
6.	Vegetables	Green chilli, green peas and sweet potato	Rythu bazar, C-camp, Kurnool city.
7.	miscellaneous products	Common salt, Coffee and Tea leaves	Near chowk masjid, mandi bazar, Kurnool city.

## III. RESULTS AND DISCUSSION

The verdicts of the present study have been discoursed in the following sub-heads:

### a) Different methods are used to detect various adulterants present in milk using specific biochemical tests

Milk samples were collected from milk suppliers at Jamia Masjid, King Market, Marwari Street, Kurnool city.

Quality control tests for milk are very important to assure adulterant-free milk for consumption since it is the one thing (or maybe the only thing, next to water) that is consumed by every human being almost every day in one way or another. Adulteration of milk reduces the quality of milk and can even make it hazardous. Adulterants such as soap, acid starch, and chemicals such as formalin may be added to milk for a variety of reasons. Most of the chemicals used as adulterants are poisonous and cause health hazards.

Generally, water is added to the milk to increase the volume content of the milk. Some of the common adulterants found in milk and their detection are given below <sup>[7]</sup>.

Food product	Adulterant	Reason	Test	Observation	Interference
Milk	Unhygienic water	To increase the volume	The presence of water can be detected by putting a drop of milk on a polished vertical surface.	The milk flowed immediately without leaving a mark.	It indicates the milk was adulterated with water.
	Detergent	To reduce the surface tension of the milk.	Shake 5-10 ml of samples with an equal amount of water.	Lather observed.	It indicates the presence of detergent.
	Starch	To supplement the solid content.	Add a few drops of tincture of iodine or iodine solution.	Blue colour formation is observed.	It indicates the presence of starch.
	Formalin	Added for preservation purposes.	Take 10 ml of milk in a test tube and 5 ml of concentrated sulphuric acid from the sides of the tube without shaking.	A violet or blue ring appears at the intersection of two layers.	It indicates the presence of formalin.
	Vanaspati	To increase the fat in milk.	Take 3 ml of milk in a test tube and add 10 drops of hydrochloric acid. Mix up one teaspoonful of sugar. After 5 minutes, examine the mixture.	The red coloration is observed.	It indicates the presence of vanaspati in the milk.
	Urea	Due to a higher fat content.	Take a teaspoon of milk in a test tube. Add 1 teaspoon of soybean or arhar powder. Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a piece of red litmus paper in it.	Remove the paper after a minute to see a change in colour from red to blue.	It indicates the presence of urea in the milk.

## b) Method of detection of common adulterants in spices and condiments

Spices and condiments samples were collected from different local wholesale and retail shops at Choti market, Badi Beedh, Kurnool city. They were checked for the presence of adulterants by biochemical qualitative examination. It was found that chilli powder, cumin seeds, turmeric powder, mustard seeds, and black pepper showed the presence of adulterants. Its harmful effect is that it can cause metal toxicity, cancer, stomach disorders, abdominal contractions, sluggishness, increased excretion and severe allergic reactions, including stomach and skin irritations <sup>[8]</sup>.

Food product	Adulterant	Reason	Test	Observation	Interference
Chilli powder	Artificial colour-Sudan red	To enhance the colour.	Sprinkle the chilli powder on a glass of water.	Artificial colorants descend as coloured streaks.	It indicates the presence of artificial colour-Sudan red in chilli powder.
	Red brick powder	To put on weight.	Any grittiness that may be felt on rubbing the sediment at the bottom of the glass.	Red residue at the bottom confirms the presence of brick powder.	It indicates the presence of red brick powder in chilli powder.
			To a little chilli powder, add a small amount of conc. HCl and mix to the consistency of a paste. Dip the rear end of the match stick into the paste and hold it over the flame.	The presence of calcium salts in brick powder gives the flame a brick red colour.	
Soap stone		Any grittiness that may be felt on rubbing the sediment at the bottom of the glass.	The smooth touch of the white residue at the bottom indicates the presence of soap stone.	It indicates the presence of soap stone in chilli powder.	
Cumin seeds	Grass seeds coloured with charcoal dust.	To put on weight.	Rub cumin seeds on your palms.	The palms darken.	It indicates the cumin seeds are adulterated with grass seeds coloured with charcoal dust.
Turmeric powder	Metanil yellow	To enhance the yellow colour.	Take a teaspoon full of turmeric powder in a test tube. Add a few drops of concentrated HCl.	The violet colour appears instantly.	The colour persists; the presence of metanil yellow is indicated.
	Yellow clay	To put on weight.	Mix the powder with water and allow it to stand for some time.	The yellow clay will settle down at the bottom, leaving turmeric on top.	It indicates the presence of yellow clay in turmeric powder.
Mustard seeds	Argemone seeds	To add bulk.	Examine it under a magnifying glass.	Seeds are more blackened, rough and non-uniform.	It indicates the mustard seeds are adulterated with argemone seeds.
Black pepper	Papaya seeds	To add bulk.	Examine it under a magnifying glass.	Shrunken, oval in shape and greenish brown or brownish black in colour, and has a repulsive flavour quite distinct.	It indicates the black pepper is adulterated with papaya seeds.

### c) Method of detection of common adulterants in sweetening agents

Sugar, jaggery, and honey samples were collected from different wholesale and retail shops at Chowk Bazaar Road, near Grand Hotel, Bongul Bazaar, Chatri Bagh, Kurnool city. All the sweetening agents (sugar, jaggery, and honey) carefully chosen for the study were found to be adulterated. Its harmful effect is that it can cause vomiting, stomach disorders, and kidney failure [9].

Food product	Adulterant	Reason	Test	Observation	Interference
Sugar	Chalk powder	To put on weight.	Dissolve 10 gm of the sample in a glass of water.	Chalk powder settles down at the bottom.	It indicates the sugar was adulterated with chalk powder.
Jaggery	Chalk powder	To put on weight.	Add a few drops of HCl solution.	Colourless and odourless gases are evolved with brisk effervescence.	It indicates the jaggery was adulterated with chalk powder.
			Dissolve a small amount of sample in water in a test tube.	Chalk powder settles down at the bottom.	
	Metanil yellow colour	To enhance the colour.	Put a teaspoon of the jaggery in a test tube. Add 3 ml of alcohol and shake the tube vigorously to mix up the contents. Pour 10 drops of HCl into it.	A pink coloration was observed.	It indicates the presence of metanil yellow in jaggery.
Honey	Sugar solution	To increase volume.	A cotton wick dipped in honey and burned.	A crackling sound is observed.	It indicates the presence of sugar solution in honey.
			Add a drop of honey to a glass of water.	Drop disperses in the water.	

**d) Methods of detection of common adulterants in oil and fats**

Ghee, butter, edible oil, and coconut oil samples were collected from different wholesale and retail shops at Pinjarwadi Street, Bada Padakhana, Kurnool City. Ghee, butter, edible oil, and coconut oil samples were analysed in the laboratory by standard qualitative tests. They found that ghee, butter, edible oil, and coconut oil samples showed the presence of added adulterates. Its harmful effects are that it can cause stomach disorders, gall bladder cancer, allergies, paralysis, cardiac arrest, and increased LDL cholesterol <sup>[10]</sup>.

Food product	adulterant	Reason	Test	Observation	Interference
Ghee and Butter	Vanaspati	To increase volume and make it yellowish.	Take about 0.5 g of the given sample of ghee or butter in a test tube. Heat the test tube gently so that the ghee melts. Add a little sugar and HCl to it. Shake the contents for about 5 minutes.	A pink colour in the aqueous layer is observed.	It indicates the presence of vanaspati in the ghee sample.
	Starchy matter		Take about 0.5 g of the given ghee or butter in a test tube. Add about 1 ml of water to it and boil. Cool and add a drop of iodine or tincture of iodine solution.	The appearance of blue colour was observed.	It indicates the presence of starchy matter in the sample.
Edible oil	Argemone oil	To increase volume.	Add concentrated nitric acid to a sample and shake carefully.	The acid layer has a reddish-brown colour.	It indicates the presence of argemone oil in edible oil.
	Castor oil		Dissolve some oil in petroleum ether in a test tube and cool it in an ice-salt mixture.	Turbidity was observed within 5 minutes.	It indicates the presence of castor oil in edible oil.
	Mineral oil		Take 2 ml of edible oil and add an equal quantity of N/2 alcoholic potash. In a boiling water bath, heat for 15 minutes before adding 10 ml of water.	Turbidity is observed.	It indicates the presence of mineral oil in edible oil.
Coconut oil	Any other oil	To increase volume.	Place a small bottle of oil in the refrigerator.	Coconut oil solidifies, leaving the adulterant as a separate layer.	It indicates the presence of any other oil in coconut oil.

### e) Method of detection of common adulterants in grains and their products

Rice, Bajra, Sago, pulses, wheat flour, and Besan or gram flour samples were collected from different local wholesale and retail shops at Mandi bazar, Nehru Road, Main bazar, Kurnool city. Rice, Bajra, Sago, pulses, wheat flour, and Besan or gram flour samples were found to be adulterated. Its harmful effect is that it can cause liver disorders, toxicity in the body, stomach disorders, skin rashes, ulcers, and lathyrism cancer [11].

Food product	Adulterant	Reason	Test	Observation	Interference
Rice	Marble or other stones	To put on weight	A simple test is to place a small quantity of rice on the palm of the hand and gradually immerse it in water.	Stone chips sink in water.	It indicates the rice was adulterated with marble or other stones.
Bajra	Infested with ergot	To put on weight	Examine it under a magnifying glass.	Long, irregular black grain. It floats in a 2% salt solution.	It indicates the bajra was adulterated with ergot.
Sago	Sand or talcum	To put on weight.	Put a little bit of sago in your mouth.	It will have a gritty feel.	It indicates the sago is adulterated with sand or talcum.
			Burn the sago.	An appreciable quantity of ash was observed.	
Pulses	Lead chromate	To enhance the colour.	Shake 5 gm of pulse with 5 ml of water and add a few drops of HCl.	The colour pink is seen.	It indicates the pulses were adulterated with lead chromate.
Wheat flour	Excess bran	To put on weight	Sprinkle on the water surface.	Bran will float on the surface.	It indicates excess bran is present in wheat flour.
	Boric acid		Put a small amount of the sample in a test tube, add some water and shake well. Add a few drops of hydrochloric acid and dip a turmeric paper strip.	It turns red	It indicates the presence of boric acid.
Besan or gram flour	Metanil yellow	To enhance the colour.	Take half a teaspoon of the besan in a test tube. Pour 3 ml of alcohol into the test tube. Mix up the contents thoroughly by shaking the test tube. Add 10 drops of hydrochloric acid to it.	A pink coloration was observed.	It indicates the presence of metanil yellow in the besan or gram flour.
	Khesari flour	To put on weight	Continue to add 50 ml of dilute HCl to the sample and simmer for about 15 minutes.	The pink colour developed.	It indicates the presence of khasari flour.



### f) Method of detection of common adulterants in vegetables

Some years ago, the perception of seasonal fruits and vegetables was communal. For example, fresh green peas and spinach were obtainable only throughout the winter season, and in the same way, watermelon and mango used to be effortlessly obtainable during the summer season. With the help of technology and chemicals, everything is now available all year, and market troupes frequently use mock colours to make these fruits and vegetables eye-pleasing.

Green chillies and green peas looking outstandingly green is not normal. Similarly, sparkling Murasaki sweet potatoes are characterised by their deep purple skin, which is also not natural. It is because artificial colours are used to make vegetables look fresh. According to specialists, these adulterants are perilous to the human body <sup>[12]</sup>.

Food product	Adulterant	Reason	Test	Observation	Interference
Green chilli	Malachite green	To accentuate the bright, glowing colour.	Take a cotton piece soaked in liquid paraffin and rub the outer green surface of a small part of a green vegetable.	Cotton turns green.	It indicates the green chilli is adulterated with malachite green.
Green peas	Artificial colour		The sample is kept immersed in water for about half an hour and stirred.	Colour separation is observed.	It indicates the green peas are adulterated with artificial colours.
Sweet potato	Rhodamine B colour		Take a cotton piece soaked in liquid paraffin and rub it on the outer red surface of the sweet potato.	Cotton absorbs colour.	It indicates the sweet potato was adulterated with rhodamine B.

### g) Method of detection of common adulterants in miscellaneous products

Miscellaneous products such as salt, coffee and tea leaves were collected from different wholesale and retail shops at Chowk Masjid, Mandi Bazaar, Kurnool city. They were checked for the presence of adulterants by biochemical qualitative analysis. It was found that salt, coffee and tea leaves showed the presence of adulterants. Its harmful effect is that it can cause diarrhoea, stomach disorders, giddiness, severe joint pains, and liver disorders <sup>[13]</sup>.

Food product	Adulterant	Reason	Test	Observation	Interference
Common salt	White powdered stone or chalk powder	To increase the amount.	Stir a spoonful of simple salt into a glass of water.	A white solution is observed. (Insoluble impurities settle down.)	It indicates the presence of white powdered stone or chalk powdered in common salt.
Coffee	Chicory	To add bulk and colour.	Gently sprinkle the coffee powder sample on the surface of water in a glass.	The sample begins to sink within a few seconds.	It indicates the chicory is adulterated with coffee.



	Starch		Make a decoction of the coffee, decolourise it by adding potassium permanganate, and then add a drop of iodine solution.	"Blue" colour observed.	It indicates the presence of starch in coffee.
	Tamarind or date-seed powder		Sprinkle the suspected coffee powder on white blotting paper and spray over it with a 1 % sodium carbonate solution.	Blotting paper turns red.	It indicates the tamarind or date-seed powder has been adulterated with coffee.
			Shake coffee powder with 2% NaOH or washing soda solution.	The formation of a reddish colour is observed.	
Tea leaves	Exhausted tea	To add bulk and colour.	Tea leaves sprinkled on wet filter paper.	Filter paper would immediately release added colour.	It indicates the exhausted tea is adulterated with tea leaves.
			Spread a little slaked lime on a white porcelain tile or glass plate. Sprinkle a little tea dust on the lime.	The lime is turning a bright red-orange colour.	

#### IV. CONCLUSION

It was observed in the present study that the non-branded local food products that were purchased from the local market of Kurnool city and tested were found to be adulterated. The objective of the present study is to create awareness in the society that aids in hand-picking the finest and most appropriate food stuffs.

#### V. REFERENCES

1. Dr. Shashikant, P. 2019, Food Adulteration: Its Implications and Control Approaches in India. International Journal of Trend in Scientific Research and Development, 3(5): 1117-1123.
2. Hasmukh, K. 2021, The food adulteration and detection in common food items. International Journal of Pharmacy and life Sciences, 12(3): 47-49.
3. Deepmalya, G. Puja Kumari, G. and Diptirani. R, 2022, A Critical review on food adulteration and its risk on health. International Journal of Novel Research and Development, 7(3): 353-356.
4. Abhirami, S. and Radha, R. 2015, Detection of food adulteration in selected food items procured by homemaker. International Journal of Recent Scientific Research, 6(8): 5938-5943.
5. Ankita, C. Neeraj, G. Fozia, H. and Skarma, C. 2020, An overview of food adulteration: Concept, sources, impact, challenges and detection. International Journal of Chemical Studies, 8(1): 2564-2573.

6. Faizunisa, H. Vaishnavi, Indra, P. and Preetha, C. 2016, Evaluation of Food Adulteration among Selected Food Items - In Vitro Study. *International Journal of Health Sciences and Research*, 6(5): 139- 145.
7. Riya, C. and Gurmeet, K. 2021, A Study on Milk Adulteration and methods of detection of various Chemical Adulterants qualitatively. *Materials Science and Engineering*, 1-11.
8. Avanti, R. Tahura, S. Soujanya and Iffath, 2019, A Study on Adulteration of Milk, Wheat flour, Red Chilli Powder and Salt from Different Zones of GHMC, Hyderabad. *International Journal of Science and Research*, 8(7): 56-58.
9. Pinal, K. D. 2022, An Introduction to Food Adulteration and Testing- A Preliminary Study. *Acta Scientific Nutritional Health*, 6(4): 159-160.
10. Asrat, A. and Ermias, B. 2015, Food Adulteration: Its Challenges and Impacts. *Food Science and Quality Management*, 41: 50-57.
11. Sonika, S. Nikita, G. and Pratibha, P. 2017, Evaluation of Adulterants in Food by Different Physico-Chemical Method. *International Journal for Scientific Research and Development*, 4(11): 58-60.
12. Hiralal, J. and Debabrata, B. 2019, Food adulteration: an emerging threat to human health in India. *International Journal of Current Research*, 11(06): 4260-4264.
13. Lakshmi, V. 2012, Food adulteration. *International Journal of Science Inventions Today*, 1(2): 106-113.