

Identification of Common Food Adulterants in Selected Food items Collected from Local Grocery Stores and Supermarkets

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Abstract—Healthy food is an essential part of a healthy life cycle. The quality and lifespan of a person depends upon the type of food he or she is consuming. Adulteration is the addition of foreign ingredients which lowers the quality of the food. Adulteration in essential food ingredients and staple food items can cause severe damage to human body. Adulterated food can cause diseases like anaemia, paralysis, cancer and when consumed in very large amounts it could lead to brain damage also. Adulteration could be accidental or purposeful. Poor handling and careless storage can also lead to adulteration. Adulterants like rhodamine dye used in red chilli, metanil yellow in turmeric, chalk powder in turmeric etc. are added to gain the financial profit. Adulteration needs to be avoided because a healthy and nutritious food is a basic right of all living beings. For protecting public health, Indian Government has formulated laws and acts to stop the adulteration of food. In this paper both physical and chemical tests were performed to detect the adulterants in the food items and beverages like tea, coffee, spices, oils and fats, asafoetida (hing), turmeric, red chilli powder, besan, wheat flour and pulses (arhar dal). The samples were procured from local markets nearby and supermarkets. With the help of these simple tests the general public i.e. the local consumer can check the quality of food they are consuming. They can test it at their home easily and can choose the right quality food for them and their families.

1. INTRODUCTION

Food is a basic right to all humans. It should be free of contaminants like toxins and other hazardous substances. When a food product fails to meet the legal standards, it is said to be adulterated [1]. Food adulteration is a punishable offense as it not only affects the food standards but also cause harm to human health. Food adulteration basically means ruining the quality and nature of given food material either through addition of some foreign substances or chemicals called adulterants. Adulterants are usually the chemicals which are inferior in quality and hence can cause harm to person consuming such adulterated food items. Adulterants are added for the purpose of unethical profit which could lead to destruction of food quality in terms of flavour and its nutritive

values. Food adulterants can be added at any stage of food processing starting from production to sale. Fresh vegetables, fruits, edible oils and spices etc. which are major part of our meal are coated with wax (to make them look attractive and fresh) or dipped in chemicals for early ripening [2].

Looking at the consequences of food adulteration and health hazards caused by it, Government of India has taken many strict actions by passing and regulating some laws so as to completely stop the adulteration of food. Most popular act that has been issued by the government of India in 1954 was “The Prevention of Food Adulteration Act (PFA) [3].

Common adulterants that are added to our daily food items are metanil yellow in turmeric and pulses, rhodamine dye in red chilli powder, cyanide in edible oils, and clay in coffee etc. Many fatal diseases like cancer, heart problems, bone marrow abnormality, neurological problems and skin disorders can be caused by addition of adulterants [4, 5].

The aim of this project was to detect adulterants in common food items like tea, coffee, spices, oils and fats, asafoetida, turmeric, red chilli powder, besan, wheat flour and pulses (arhar dal). The samples obtained from local markets and departmental stores were tested for the presence of adulterants. Simple tests which can be done easily at home were performed to detect food adulteration.

2. MATERIALS AND METHODS

Sample procurement: Four samples each of tea, coffee, oils and fats, asafoetida, turmeric, red chilli powder, besan, wheat flour and arhar dal were collected from local grocery and departmental stores.

Detection of adulterants in different food items:

Qualitative tests involving both physical and chemical analysis for the detection of adulterants in selected food items were

carried according to procedures published in FSSAI manual [6, 7, 8]. The protocol of the tests performed is shown in Table 1.

Table I: Qualitative detection of adulterants in food

Food Article	Adulterant	Method for Detection	Observations
Edible oil	Mineral oil	To 1 ml of oil sample, equal volume of alcoholic KOH was added, the contents were heated for 5 min followed by addition of 10 ml of hot water	Appearance of white turbidity indicates the presence of mineral oil
	Castor oil	To 1 ml of oil sample, 10 ml of acidified petroleum ether was added. After proper mixing few drops of ammonium molybdate reagent was added	Appearance of white turbidity indicates the presence of castor oil
	TOCP (Tri-ortho-cresyl-phosphate)	To 2 ml of oil sample, butter yellow crystal was added	Formation of red colour immediately indicates the presence of TOCP
Spices			
Turmeric	Metanil yellow	To 1 teaspoon of turmeric powder, added 5 ml of conc. HCl	Immediate appearance of pink colour indicates presence of metanil yellow
	Chalk powder	To 1 teaspoon of turmeric powder, added 5ml of conc. HCl	Incidence of effervescence indicates the presence of chalk powder
	Starch	To 1 teaspoon of turmeric powder, added few drops of iodine	Formation of blue-black colour indicates the presence of starch
Asafoetida	Chalk powder	To 5g of asafoetida, added 5ml of conc. HCl	Occurrence of effervescence indicates the presence of chalk powder
	Foreign resin	5g of asafoetida was taken to the flame	Burning of asafoetida like camphor indicates the absence of any foreign resin

Red chilli powder	Artificial colour	To 2g of chilli powder, added 5 ml of water	Formation of reddish brown colour indicates the presence of artificial colour
	Rhodamine B	To 2g of chilli powder, added 5 ml of acetone	Formation of red coloured solution indicates the presence of rhodamine B
Beverages			
Tea	Artificial dye	5g of tea sample was rubbed on the surface of blotting paper.	Occurrence of dark red or yellow colour indicates the presence of artificial colour
	Iron fillings	To the surface of 10g of tea sample, bar magnet was moved	Adhering of distinct granules to the magnet indicates the presence of iron fillings
Coffee	Clay	To half teaspoon of coffee powder, added 10 ml of water	Deposition of clay particles at the bottom indicates their presence
Pulses			
Arhar dal	Metanil yellow	To 5g of arhar dal, added 5 ml of conc. HCl	Formation of pink colour solution indicates the presence of metanil yellow
Besan	Metanil yellow	To 5g of besan, added 5 ml of conc. HCl and heated for 5min	Formation of pink colour solution indicates the presence of metanil yellow
Cereal			
Wheat flour	Excess Bran	To 2g of wheat flour, added 10 ml of water	Floating of husk like substance indicates the presence of bran
	Sand /Dirt	To 5g of wheat flour, added 20 ml of carbon tetrachloride	Observation of standing dirt for some time indicates its presence
	Chalk powder	To 2g of wheat flour, added 5ml of dil. HCl	Occurrence of effervescence indicates the presence of chalk powder
Sugar			

Jaggery	Washing soda	To 5g of ofjaggery, added few drops of dil.HCl	Occurrence of effervescence indicates the presence of washing soda
	Chalk powder	To 5g of jaggery, added 2ml of conc. HCl	Occurrence of effervescence indicates the presence of chalk powder
	Metanil yellow	To 5g of jaggery added 5 ml of conc. HCl and heated for 5 min	Formation of pink colour solution indicates the presence of metanil yellow

3. RESULTS

All the 4 samples of edible oil showed presence of castor oil and mineral oil and absence of TOCP. One sample of turmeric showed presence of starch. Asafoetida samples (2) showed the presence of chalk powder. In three out of four samples of red chilli powder artificial colour and rhodamine was found to be present. One sample of tea showed the presence of artificial dye. Two samples of coffee showed the presence of clay. Arhar and besan samples did not show any adulterant tested. Three sample of wheat flour showed the presence of bran and two samples tested positive for sand/ dirt and chalk powder. None of the jaggery samples tested showed the presence of washing soda and metanil yellow, only one sample tested positive for chalk powder. Representative pictures of some test are shown in Figure 1.

The presence (+) and absence (-) of different adulterants tested in selected food items is shown in Table II.

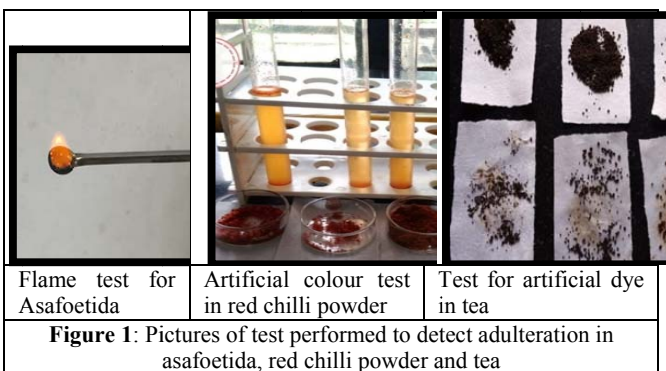


Table II: Results of tests performed to detect the adulterants [(+ indicates presence and (-) indicates absence)]

Food item	Adulterant	Sample 1	Sample 2	Sample 3	Sample 4
Edible Oil	Castor oil	+	+	+	+
	Mineral Oil	+	+	+	+
	TOCP	-	-	-	-

Turmeric	Chalk powder	-	-	-	-
	Metanil yellow	-	-	-	-
	Starch	-	+	-	-
Asafoetida	Chalk powder	-	-	+	+
	Foreign resin	-	-	-	-
Red Chilli Powder	Artificial colour	+	+	+	-
	Rhodamine	+	+	+	-
Tea	Artificial dye	-	-	+	-
	Iron filings	-	-	-	-
Coffee	Clay	+	-	+	-
Arhar	Metanil yellow	-	-	-	-
Besan	Boric acid	-	-	-	-
	Metanil yellow	-	-	-	-
Wheat flour	Excess bran	+	+	-	+
	Sand/Dirt	-	+	+	-
	Chalk powder	-	+	+	-
Jaggery	Washing soda	-	-	-	-
	Chalk powder	-	-	+	-
	Metanil yellow	-	-	-	-

4. CONCLUSION

Intake of natural and non-adulterated food is crucial for our day to day life. Food adulteration is one of the silent poisons which is internally destroying our health. Adulteration is intentional or accidental deterioration of the food quality, either by addition of the low-quality ingredients or removal of valuable substances. Adulterant can have adverse impact on our health when consumed recurrently. From the above findings we can conclude that adulteration is commonly practiced in both branded and non-branded food. Hence, one needs to be cautious when buying any grocery food items and should check for the presence of any adulterant(s) prior to its consumption. In this paper, we have demonstrated certain tests which don't require expertise and can be easily performed at home. Therefore without compromising with one's health one shall make an effort to check the presence of adulteration and also spread awareness of this problem and strategies to deal it with. The consumer should also avoid buying food from an unhygienic place and preparation of food under unhygienic conditions. Label statement on packed food is very essential for the awareness of the ingredients and nutritional value. One should also have the courage to raise voice against any such practice that one gets to know of.

Eat safe, stay healthy.

5. ACKNOWLEDGEMENT

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