



# International Journal of Home Science

ISSN: 2395-7476  
IJHS 2018; 4(3): 257-260  
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www.homesciencejournal.com  
Received: 13-07-2018  
Accepted: 14-08-2018

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## Detection of adulteration in food commodities from selected outlets

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### Abstract

Ensuring food safety and quality is an extremely important public health concern. The presence of toxins, contaminants, excessive and harmful additives in food items can affect consumer's health. Foods may be adulterated with non-food material or inferior quality product. Consumption of adulterated foods could lead to disease outbreaks of epidemic proportions. Buying from a reliable and reputed source, careful checking of foods before purchase and insisting on certified brands will all minimize the risk of food adulteration. The analysis of raw or processed samples helps achieve food safety, quality and better nutrition. The present study was conducted to test for the presence of adulterants in commonly consumed food ingredients such as cereals, pulses, fats and oils, sugars, masala powders, milk etc. selected from different outlets such as ration shop(public distribution), supplyco (government outlet), supermarkets, provision shops in the urban and coastal areas of Ernakulam to compare the quality of products. Physical and chemical tests as per FSSAI guidelines were conducted to test for the type of adulterants, prohibited colours, other additives etc. in selected food samples. Commercially available food adulteration detection kits were also used. Results indicated that instances of adulteration were more rampant in the urban and in the supplyco and provision shop outlets. It was found that the commodities sugar, turmeric powder, chilli powder, coriander powder, asafoetida were adulterated. Samples of milk, bottled water tested were relatively free from commonly detected adulterants. It was seen that food commodities purchased from supermarkets had a longer shelf life.

**Keywords:** Food adulterants FSSAI, chemical methods, physical methods, food adulteration kits

### 1. Introduction

In India, adulteration and contamination are encountered in food consumed at the household level, in the food service establishments and business firms, and also when sold as street foods (Gahukar, 2014) <sup>[1]</sup>. The problem of adulteration makes the food items used in daily life unsafe and unhygienic for use. The traders use it for their economic benefit without thinking about its effect on the health of common population of the country, which consumes it (Gautam, 2013) <sup>[2]</sup>. Foods may be adulterated with non-food material or inferior quality product. Spoilt, stale or poor quality food is made attractive and fresh by adding harmful colors or other chemicals. Frequently adulterated food items are milk and milk products, cereals, pulses and their products, edible oils and spices. The different classes of adulterants include non-permitted colors like metanil yellow; non-edible oils like castor oil; cheaper agricultural produce like various starches in milk powder; extraneous matter like husk, sand and sawdust; and metal contaminants like aluminum or iron filings. Consumption of adulterated foods could lead to disease outbreaks of epidemic proportions. Buying from a reliable and reputed source, careful checking of foods before purchase and insisting on certified brands will all minimize the risk of food adulteration. However, adequate precautions taken by the consumer at the time of purchase of such produce can make him alert to avoid procurement of adulterated food. It is equally important for the consumer to know the common adulterants and their effect on health (Singh, 2010) <sup>[3]</sup>. Thus food sampling and analysis is a vital tool. The analysis of raw or processed samples helps achieve food safety, quality and better nutrition (Kaur, 2016) <sup>[4]</sup>.

### 2. Methodology

#### 2.1 Selection of Area

Ernakulam district of Kerala State was selected as the locale for the study. The study was conducted in the two major social demarcative areas of Ernakulam district – the urban (Ravipuram) and coastal (Puthuvype) areas.

## 2.2 Selection of sample

In the present study, to test for the presence of adulterants in foods, commonly used food ingredients such as cereals, pulses, fats and oils, sugars, masala powders, milk etc. were selected from different outlets such as ration shop (public distribution), supplyco supermarket (government outlet), provision shops in the urban and coastal area from where people commonly purchase commodities.

## 2.3 Methods to detect adulterants in the selected food stuffs

Adulteration detection tests in the common food ingredients were determined using detection kits and lab analysis of samples to test for the type of adulterants, pesticide residues, prohibited colours, other additives etc.

The various methods used to detect adulteration in the selected food stuffs were

- Physical analysis as given by FSSAI
- Chemical analysis as given by FSSAI
- Adulteration detection using food adulteration kit

## 2.4 Physical and chemical tests to detect adulteration in selected foods

Selected food stuffs were subjected to physical and chemical tests to determine the presence of adulterants using the standard procedures given in Food Safety and Standards Authority of India (FSSAI) manual.

## 2.5 Detection of adulteration using food adulteration detection kit

Food adulteration kits serve as a useful tool which can be used at home by consumers to test food stuffs for adulteration through simple procedures. It is manufactured by Nice Chemicals and commercially available in selected outlets. The cost of the kit is Rs. 1200. The kit comprises of an airtight box which consists of several chemicals to test food stuffs and an instruction manual indicating the tests that can be conducted. This kit is useful and convenient for consumers or units like kudumbashree (women's organization), institutions or small scale enterprises to test for the presence of common adulterants in food without the help of analytical laboratories saving the cost and time involved. Figure depicts the food adulteration kit.



Fig 1: Commercially available food adulteration detection kit and the reagents

Selected food stuffs were analysed for adulterants using the food adulteration kit. The following were the tests conducted; Presence of

- Mineral oil and castor oil in edible oils
- Vanaspathi and mashed potatoes in ghee
- Chalk powder and washing soda in sugar and jaggery
- Boric acid in rice
- Papaya seeds or light black berries in black pepper
- Metanil yellow in turmeric powder
- Brick powder, sudan III and water soluble synthetic colours in chilli powder
- Used tea leaves in tea dust
- Chicory and tamarind seed powder in coffee powder

Tests for the presence of adulterants were carried out using the reagents available in the food adulteration kits.

## 3. Results and Discussion

### 3.1 Comparison of the quality of commonly used food items from selected outlets

Provisions used regularly by consumers - in Kerala, comprising of foods from the different food groups were selected and compared for their quality by physical tests and chemical tests for the presence of adulterants. The provisions were selected from 4 different outlets, commonly purchased by consumers namely ration shop (public distribution),

supplyco, provision shop and supermarket in both urban and coastal area. Presence of commonly added adulterants were tested for.

### 3.2 Adulterants present in cereals, cereal products and pulses

The cereal tested for was parboiled rice, cereal products were parched rice, rice flour, wheat flour and maida. Analysis revealed that samples of parboiled rice and parched rice were free from the adulterants tested for viz boric acid, metanil yellow and urea. Rice flour collected from the different outlets were tested for commonly used adulterants in cereal flours namely chalk powder and boric acid and was found absent. Samples of maida were free from adulterants such as boric acid, metanil yellow and urea. In the sample of wheat flour from supplyco of coastal area, sand and bran were present. The samples of wheat flour from provision shop of both the coastal and urban area were also adulterated with its bran alone. All the other cereal and cereal products were free from adulterants.

Pulses (dhal) were also free from adulterants such as added colour and kesari dhal.

Hence it was seen that among the cereals, cereal products and pulses, only wheat flour was found to be adulterated in both coastal and urban area purchased from supplyco and provision shop.

### 3.3 Adulterants present in spices, tea and coffee

Various types of adulterants were tested for in selected

samples of spices and the results given below.

**Table 1:** Adulterants present in spices, tea and coffee from selected outlets

Food Items	Adulterants tested for	Adulterants detected					
		Supplyco		Supermarket		Provision shop	
		Urban	Coastal	Urban	Coastal	Urban	Coastal
Asafoetida	Soap stone, other resins, chalk powder	Soap stone, other resins	Soap stone, other resins	Soap stone, other resins	Soap stone, other resins	Soap stone, other resins	Chalk powder
Chilly powder	Red lead salt, brick powder, red colour dye, colour, starch	Nil	Nil	Nil	Nil	Brick powder, colour	Nil
Turmeric powder	Colour, metanil yellow, yellow lead salt, coloured saw dust, yellow clay, chalk/yellow soap stone	Yellow lead salt, Yellow clay	Nil	Yellow clay	Nil	Colour	Yellow clay, colour
Coriander powder	Common salt, starch, colour	Nil	Nil	Nil	Nil	Colour	Nil
Pepper	Dried papaya seeds, coated with mineral oil, light berries	Dried papaya seeds, light berries	Nil	Nil	Nil	Light berries	Nil
Coffee powder	Tamarind seed powder	Nil	Nil	Nil	Nil	Nil	Nil
Tea	Coloured tea leaves, used tea	Nil	Nil	Used tea	Nil	Coloured tea leaves, used tea	Used tea

Asafoetida was found to be the most commonly adulterated spice and amongst tea and coffee, tea was found to be adulterated. The study revealed that adulteration of spices was more rampant in the urban than coastal outlets.

Samples of asafoetida from all the outlets of both coastal and urban area indicated the presence of soap stone and other resins as adulterants.

Chilly powder from the provision shop in the urban area was adulterated with brick powder and added colour. In all the other outlets, the chilly powder samples did not show the presence of the tested adulterants.

The samples of turmeric powder collected from the provision shop of both areas were adulterated with added colour. Turmeric powder sample of supplyco in urban area showed the presence of yellow lead salt and yellow clay. Yellow clay was also present in the turmeric powder samples collected from provision shop of coastal area and supermarket of urban

area.

The samples of coriander powder from the provision shop of urban area were found to be adulterated with added colour.

Pepper sample of the supplyco outlet of the urban area was adulterated with the dried papaya seeds and light berries. The sample from provision shop of the urban area was also found to be adulterated with the light berries.

The samples of coffee powder were free from the tested adulterant namely tamarind seed powder. The sample of tea from provision and supermarket of the urban area were adulterated with coloured leaves and used tea. The provision shop of coastal area also contained used tea as an adulterant in tea powder.

### 3.4 Adulterants present in sugar, jaggery and honey

Selected samples of sugar, jaggery and honey were tested for the presence of adulterants.

**Table 2:** Comparison of quality of sugar, jaggery and honey from selected outlets.

Food Items	Adulterants tested for	Adulterants detected							
		Ration shop		Supplyco		Supermarket		Provision shop	
		Urban	Coastal	Urban	Coastal	Urban	Coastal	Urban	Coastal
Sugar	Chalk powder, washing soda, urea, yellow colour	Nil	Nil	Nil	Nil	Chalk powder	Chalk powder	Chalk powder	Nil
Jaggery	Washing soda, chalk powder, metanil yellow			Washing soda, chalk powder	Nil	Nil	Washing soda, chalk powder	Washing soda, chalk powder	Nil
Honey	Water, sugar			Water	Nil	Nil	Nil	Nil	Nil

Tests revealed that chalk powder was surprisingly present in the sugar samples collected from the supermarket of both urban and coastal area and provision shop of urban area.

The jaggery sample from provision shop and supplyco of the urban area and supermarket of the coastal area were adulterated with washing soda. Added colour was absent in the samples collected from all the outlets. The honey sample collected from supplyco of urban area was adulterated with water. There was no added sugar found in any of the samples tested. Jaggery and honey are not available in the ration shop.

Two samples of milk were tested for the presence of adulterants namely detergent, synthetic milk, vanaspathi, formalin, hydrogen peroxide and ammonium sulphate. Sample 1 (Milma - Pasteurised toned milk) was free from all the tested adulterants except for the presence of traces of formalin, indicated by the presence of a light violet ring. Sample 2 (PDDP – Pasteurised toned milk homogenised) was free from all the tested adulterants. Hence it was seen that the samples of milk tested were relatively free from commonly detected adulterants.

#### 4. Conclusion

Among food stuffs it was seen that among the cereals, cereal products and pulses, only wheat flour was found to be adulterated in both areas. Commonly adulterated food stuffs were asafoetida and turmeric powder in both areas while adulteration in jaggery and sugar was more in urban area. Chalk powder was the most common adulterant in sugar while the adulterants in jaggery were washing soda and chalk powder. Food stuff not adulterated in any of the areas and outlet was coffee powder. Samples of asafoetida indicated the presence of soap stone and other resins as adulterants in all the outlets and both areas. The samples of milk tested were relatively free from commonly detected adulterants. It was seen that ingredients purchased from supermarkets had a longer shelf life which maybe attributed to the addition of adulterants. Bottled drinking water samples were free from harmful metals like lead and mercury. Chilly powder and coriander powder were found adulterated in both urban and coastal area. Among the outlets it was found that instances of adulteration was more in the supplyco and provision shop of urban area. Area wise, incidence of adulteration was higher in the urban area.

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