

Identification of Adulterants in Food

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Abstract:- Food is the key to life. However, due to commercial aspects, it gets adulterated. To increase their profit by reducing production costs. They see food as a commercial good rather than a life-giving substance. So they adulterated it. Because of this, humans as well as animals are suffering from many health issues and environmental damage. So, there is a necessity for creating awareness in society about food adulteration. There is scope and necessity to employ scientific methods and scientific study in identifying food adulterants. In the present study different methods were used for identifying the adulterants in chilli, milk, sugar, oil.

Keywords:- Turmeric, Adulteration.

I. INTRODUCTION

There are so many research papers and books published about food adulteration. In that, we went through some research papers and articles about food adulteration. Food Adulteration and Some Methods of Detection, Review by Misgana Banti (Food Science and Nutrition Researcher, Ethiopian Institute of Agricultural Research, Jimma Agricultural Research Centre, and Ethiopia), this article gives brief information about food adulteration and methods of detection.

This article mainly emphasises food adulteration in Ethiopia that are easily prone to food adulteration, such as milk, meat, honey, butter, juices, etc. adulteration of food known as "injera," which is similar to Indian dosa. They found that this food is adulterated by sawdust. These articles explain different types of methods, such as physical, chemical, biochemical, and other techniques. This article also explained the detection of food adulterants is more difficult when both the adulterant and food have approximately the same physiochemical makeup. This article also emphasises the word "adulteration," which doesn't mean making food poison like most people think but means that the food doesn't meet the federal or state standard. This article also mentioned real-life scenarios like the one in the People's Republic of China (the Chinese milk scandal case with melamine), in which some children were killed and thousands were harmed, which has attracted much public attention. The reason for this article to be published is to have a literature review on food adulteration in the author's country. This article mentions the history of food adulteration from ancient times. These are some methods of food adulteration mentioned in the article. Addition of extraneous matter, e.g., addition of sand to food grains and water to milk. Mixing inferior quality material with a

superior one, e.g., mixing used or spent tea leaves with fresh tea leaves, the use of prohibited dyes and preservatives, e.g., the colouring of spices; Extraction of valuable ingredients, e.g., abstraction of fat from milk or oils from spices. These are some of the basic types of food adulteration mentioned in the article. A substance is added that decreases its value or injuriously affects it. Less expensive or inferior substances are substituted wholly or in part. Any valuable constituents have been subtracted, either wholly or in part. If it is counterfeiting (imitation). If coloured or otherwise treated, to improve its appearance with stuff injurious to health. No matter what the reason is, if its quality is below standard. This article also mentions that adulteration in developing countries like ours is a serious problem because there are fewer strong regulatory bodies than in the developed world. This article also mentions sensory methods for identifying quality food products. Also discussed are its drawbacks and uses, and different regulatory bodies like the American Society for Material Testing and the International Standard Organisation using these methods. Physical methods are also used under a microscope or normally. Observations like morphology, bulk testing, texture, or solubility are used in these methods. The above-mentioned methods are different detection methods. Previously, organoleptic methods were used, but now, due to scientific advancement, new methods have been used.

According to this article, adulteration has two types. The first is intentional adulteration, and the second is unintentional adulteration. Intentional adulteration can be done by many methods, but unintentional adulteration is only done by improper hygienic practices and industrial waste. Analysis of food adulteration in selected food items purchased from local grocery stores. Here they collected items from local grocery stores in the twin cities of Secunderabad. Here they called different food items and identified the corresponding adulterants, used specific identification methods, identified different adulterants, mentioned health hazards that occurred due to these substances, and found out in what proportions they used to have done this adulteration and how many stores were adulterating and how many were not. Finally, this paper gives the whole summary of how grocery shops are adulterating and how people can avoid it.

Food Adulteration: A Review by Ameeta Sharma, Neha Geek Batra, Anjali Garg, and Ankita Saxena This journal is based on a theoretical basis. Here they study some cases and mention their effects on the human body. Here, they study the nature of adulterants. How it affect the human

body and how many times does this kind of adulteration happen in that situation.

Food adulteration: its implications and control approaches in India, by Dr. Sheshikanth Pardeshi This journal mainly emphasises the health effects of food adulteration and how we can stop it from spreading. This article gives an idea not only about urban and semi-urban areas but also how rural areas are affected by this food adulteration. This journal also suggests some ideas to the government and regulatory bodies on how we can stop this food adulteration. It emphasises how additives are different from adulteration and how if we add more additives, they act as adulterants. It also mentions mild to severe diseases, like headaches and cancer. This journal also mentions how the attitude of Indian consumers to buy more goods at lower prices motivates the producers to make cheap, quality goods. [1]

II. AIMS AND OBJECTIVES

- Identifying adulterants in food substances like turmeric, sugar, chilli, milk and oil.
- To create awareness about food adulteration in society.
- To ensure food safety.
- To promote fair trade practices.
- Studying different methods to identify adulterants, from simple to complex and natural to chemical methods.
- Studying the aftermath effects of food adulteration

III. RESULTS AND DISCUSSION

A. Identification of adulterants in turmeric powder

Adulteration of turmeric with sawdust is often done to increase the quantity of the product and to decrease the cost of production. Sawdust is low-cost and readily available. It can be done to mask the poor quality of the turmeric powder.

Adulteration of turmeric with chalk powder is often done to increase the weight of the product and reduce the cost of production. It is also low cost material. Low-quality turmeric may have a dull or uneven colour, and the addition of chalk powder can help to make the colour appear more uniform. [2]

So we made an attempt to find the adulterants with the following simple procedure

Apparatus: Two test tubes, water, HCl, spatula, test tube holder, dropper and gloves.

➤ Procedure:

- Take one test tube and pour some turmeric powder in it. Add some water to it.
- Take another test tube and pour some turmeric powder in it. And more water than compared to the first test tube.
- Add some dil HCl in both test tubes.
- Leave them for 10 minutes.
- We observe that CO₂ is formed in first test tube and form brisk effervescence.
- In the second test tube no CO₂ is released.

➤ Chemical reaction:

Test tube-1: $\text{CaCO}_3 + \text{dil.HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$ (Brisk effervescence)

Test tube-2: without adulterant + dil.HCl \rightarrow no reaction

➤ Result

In the first test tube, we observed that CO₂ and brisk effervescence formed while in the second test tube, those were not formed. So we can conclude that the turmeric powder is adulterated in the first test tube. While the turmeric powder in the second test tube is pure.

B. Identification of adulterants in sugar test

Adulterating sugar with sand or grit is a fraudulent practice that is done to increase the weight of the sugar and thereby increase profits for the seller. Sand or grit is cheap and readily available materials that can be added to sugar without changing its appearance, making it difficult to detect the adulteration without proper testing. Talcum powder, washing soda and chalk are used to increase the weight or volume of sugar and thus, increase profits for the seller. They are cheaper than sugar, and adding it to sugar allows the seller to sell more products without incurring additional costs.

So we made an attempt to find the adulterants with the following simple procedure [3].

➤ Apparatus: Sugar, test tubes, beaker, dil HCl, Spatula, test tube holder, dropper, gloves.

➤ Procedure: Sugar is usually contaminated with washing soda and other insoluble substances.

➤ Beaker-1:

- Take a small amount of sugar in a test tube and shake it with a small amount of water.
- Pure sugar dissolves in water but insoluble impurities do not dissolve.
- It takes 1.45 s to dissolve completely in water.

➤ Beaker-2:

The second beaker is to find the adulterant in another type of sugar.

- Pour some sugar into the second beaker and add some water to it.
- Leave it for some time.
- We observe that the sugar does not dissolve in water completely. We observe that the particles of sugar have settled down which are undissolved in the bottom of the beaker.
- From above we can conclude that the sugar present in the 2nd beaker is adulterated.
- The adulterated sugar in the 2nd beaker took more time compared to 1st beaker which is about 1 hour.

➤ Result

- In the first test the sugar is completely dissolved in water it takes less time i.e. 1.45 s. So the sugar is pure.

- In the second beaker sugar is not dissolved in water completely and took longer time compared to first i.e. about 1 hour.

So we can consider it as adulterant sugar.

C. Identifications of adulterants in chilli powder

Adulteration of chilli powder with brick powder or saw dust is a common practice used by some unscrupulous suppliers and manufacturers to increase the weight of the product and thus increase their profits. Brick powder is cheaper than chilli powder and has a similar colour and texture, making it an attractive option for those looking to cut corners.

Adulteration of chili powder with Sudan red, a synthetic dye, is another common practice used by some unscrupulous suppliers and manufactures to enhance the colour of chili powder and make it appear more vibrant, fresh, and attractive to consumers. Sudan red is cheaper than natural red chilli powder and can be easily mixed with it to achieve the desired color.

Adulteration of chilli powder with starch is another common practice used by some unscrupulous suppliers and manufacturers to increase the weight of the product and thus increase their profits [4]

So we made an attempt to find the adulterants with the following simple procedure

Apparatus: 2 test tubes, water, chilli powder, spatula, test tube holder dropper gloves.

Procedure: chill powder after adulterated with red colored lead salts in brick powders.

➤ Test-1:

- Take a glass of water and add a teaspoon of chilli powder in to it.
- Now, take a small quantity of the residue on your palm and rub it well
- If you feel any grittiness after rubbing, then the chilli powder is adulterated with brick powder
- In case, the residue feels soapy and smooth then it is adulterated with soapstone

➤ Test-2:

- Take one beaker and add water in a fresh beaker.
- Add a teaspoon of chilli powder into it.
- If the sawdust floats at the surface of the water, chilli powder will settle down in the bottom. Then it is adulterated with sawdust.

D. Identification of adulterants in chips test.

- Adding plastic to potato chips can be cheaper than using all-natural ingredients, allowing manufacturers to save money on production costs. Plastic additives can help extend the shelf life of potato chips, preventing them from going stale too quickly and reducing the amount of waste. Plastic additives can be used to give potato chips a desirable texture, such as a crunchy or crispy texture, which can make them more appealing to consumers. Some plastic additives can be used to enhance the

appearance of potato chips, making them look more visually appealing and increasing their sales. [5]

So we made an attempt to find the adulterants with the following simple procedure

➤ Apparatus: Chips and Kurkure, Bunsen burner, watch glass, staner, test tube, Holder gas and lighter.

➤ Procedure:

First, take some different kinds of chips sample;

Kurkure

- First take a sample.
- Then ignite the Bunsen burner.
- Hold the sample with Holder.
- Burn it in flame.

➤ Observation: It forms like a sticky substance.

Bingo

- First take a sample.
- Then ignite the Bunsen burner.
- Hold the sample with Holder.
- Burn it in flame.

➤ Observation: It forms like an ashy substance.

Plane allu chips

- First take a sample.
- Then ignite the Bunsen burner.
- Hold the sample with Holder.
- Burn it in flame.

➤ Observation: It forms like an ashy substance.

➤ Result

The substance which adulterates forms a sticky substance and the substance which pure forms an ashy substance because pure food material forms with starch. Therefore here Kurkure is adulterated but Bingo and aalu chips are pure.

E. Identification of adulterants in milk.

Adding water to milk is a cheap way for suppliers to increase the volume of their products and make more profit. In some cases, milk suppliers may add water to poor quality milk to improve its appearance and taste. This can be done to mask the poor quality of the milk and make it appear fresher.

Adding starch to milk is a cheap way for suppliers to increase the volume of their products and make more profit. Increase thickness: Milk is a naturally thin liquid, and some consumers prefer milk with a thicker consistency. Starch can be added to milk to increase its thickness and make it appear creamier and richer.

Urea and formalin are used to increase protein content in milk and it also acts as preservatives. It also helps to mask the quality of milk.

Synthetic milk can be produced at a lower cost than natural milk. Adulterating natural milk with synthetic milk can increase the volume of the milk and allow suppliers to sell more milk and make more profit. It can reduce the cost of production, allowing suppliers to sell milk at a lower price. It can be made with preservatives and other additives that can increase its shelf life.

So we attempted to find the adulterants with the following simple procedure [6].

➤ *Apparatus: Milk, test tube, watch glass, test tube, holder, spatula, gas, water, iodine, segments.*

➤ *Procedure:*

- Take one watch glass and add milk.
- Take another watch glass and add milk and some amount of water.

- Heat both watch glasses with a burner.
- While heating add 2 drops of iodine to the both watch glass.
- In the first watch glass milk changes are not observed. In the second watch glass milk colour is changed to violet.
- So the first watch glass milk is pure and the second watch glass milk is adulterant.

The milk test process -2:

- Take one test tube and add 20 ml of pure milk.
- Take another test tube adding 10 ml of milk and 10 ml of water
- Then close test tubes 1 and 2 with the help of caps like watch glasses
- Both are mixed for 5 minutes.
- The milk in the first test tube remains the same without any bubbles.
- In the second test tube water is separated and bubbles are formed. So we can conclude that the milk in the second test tube is adulterant, the process shown in Fig.1.



Fig.1. process of checking milk adulteration

F. Identification of adulterants in oil (cooking oil)

Adulterants in oil can affect the health of consumers adversely. Mustard oil adulterated with argemone oil and butter yellow has been reported to cause gallbladder cancer. Similarly, argemone oil mixed with edible oils can lead to epidemic dropsy. Glaucoma and loss of eyesight.

For this, we don't need to do any experiments in the lab. It is a simple process.

- If the cooking oil is pure it will appear light yellowish.
- So we can say that it is a pure form of oil/unadulterated oil.
- If the cooking oil is impure the colour of the oil completely changes. It will appear in some other colour.
- The quality of the oil changes completely.
- In this way we can identify the pure and adulterated oils the process shown in Fig.2.



PURE OIL



ADULTERATED OIL

Fig.2. process of checking oil adulteration

By this we should prefer pure oil while buying by seeing the colors of oil.

IV. CONCLUSIONS

Most of the food adulterants cause stomach problems only like food poisoning, gastric problems, and bloating. Long term usage of these food materials is the worst thing to happen to any human being. It causes irreplaceable damage to the body. In public, there is demand for good products. So, most of the adulterants are used for texture improvement, colour improvement. Normally, low level traders adulterate with volume based things. And high level traders adulterate with quality based things. The greater the demand for a product the greater the chances of adulteration. Some food materials have medicinal values and these products are used as raw materials in some medical industries. If these materials are adulterated these medicines also cause negative effects. Example turmeric.

Food is not just a commercial good rather than a life-giving substance. Even if people have some concern for other people's health this won't happen. So we need to make people aware. Consumers need to buy food materials from trustworthy ones. And it is better to consume from direct producers rather than retailers and wholesalers. The primary source of food material comes from our earth and environment. So we mustn't pollute our environment. Even if we don't adulterate food material with adulterants we produce food from polluted soil. It is as bad as adulterated food. So we have to save our planet. There is something called "unintentional adulteration". It means even if we don't adulterate food, due to some external factors food is still adulterated. So we can't eliminate the adulteration of food. So the slogan of the article is avoid adulteration stay healthy.

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