Food Adulteration

Name – Pragyan Khati

Roll No -26

Subject - Chemistry

**Background**

We all know that the quality of food products is quintessential in regulating the health of population. Whilst some of the food products are sold to the consumers in regulation with the legal terms provided by the government, majority of companies don’t comply with the regulations. Such companies provide products by debasing the quality of the product for the sake of increment in product.

‘Food Adulteration’ is understood as the mixing of non-nutritious ingredients to increase the amount of the products in raw form, be it intentionally or unintentionally[1]. Adulteration is a global crisis, it’s a severe issue inferring major health risks in many countries. There are different types of food adulteration such as : medicines, vegetables, creams so on and forth.

There are many reasons as to why food products are adulterated. Especially in cases where the food products are rip-offs of other established products so as to deliberately establish its uniqueness. Increasing population constitutes increasing demand. However, due to the unavailability of resources, it might not be possible to provide the population with the required products which forces companies into adulteration to conceal losses in the market. Majority of food adulterations are intentional. Nevertheless, unintentional adulteration does exist and pose as much of a threat as intentional ones. Unintentional adulteration is due to lack of proper training facilitated to the food handlers and other workers.

Such adulteration brings nothing but harm to the health of population, giving a boost to the rise of food-borne diseases which is a major blow to the nation in all kinds of aspects. For which, WHO (World Health’s Organization) has implemented some significant regulations. It talks about promoting preventive food-system management, carrying out researches and projects in context with local consumption including food-borne diseases, Continuous surveillance of the food products being manufactured. State members need to assure proper education of food handlers and other workers. There must be serious developments to the food legislation. Various types of national food safety programmes should be organized by member states so as to spread awareness.[2]

However, these regulations for companies seem to be nothing but a bad joke as they carry on with their ill-doings. For an instance, majority of Nepalese are obsessed with fast foods, prominently noodles. However, there have been many cases in the past which led to discoveries where it has been found that it is intoxicated with lead. It is done so to enhance the taste of the product so the consumers are more addicted to it. It has been found that noodles are adulterated with remnants of lead, going against the standard of 0.0025mg/kg standardized by WHO [3]. Similarly, dairy products like dairy, milk etc. are adulterated with starch and water, coffee powders are adulterated with tamarind seeds and chicory powder. [4]

These are just some few cases in paper, what lies behind these papers are horrendous. We can see that companies are shamelessly adulterating food for the sake of profit and such by disregarding the laws and regulations implicated by various health firms. From such observations, one can but doubt the efficiency of health firms, organizations and government officials regarding their stand against food adulteration.

**Objective**

It is clear that adulteration poses a serious threat to the health of population. To constitute the component of flourishing health, one must take into consideration the prospect of examining the quality of the products supplied to the demography.

The use of adulterants was first recognized by German scientist Frederick Accum. His work identified many toxic metal colorings in foods and drinks. However, he was bashed by the companies for disclosing the truth. Later, the physician Arthur Hill Hassall initiated studies in 1850s, published in ‘The Lancet’ which led to 1860 FAA (Food Adulteration Act) and other sorts of legislation. [5]

From this, we can verify that identification of adulterates is very significant in marking changes in the field of food products and holds an enormous strength to eradicate the trend of food adulteration.

Hence, the objective of this project writing revolves around evaluation of some of the common food adulterates found in common food products. In this project, different food items are tested in laboratory by some tests to detect the presence of adulterants.

**Methodology**

SAMPLE 1: Detection of Yellow Dye in Turmeric Powder

Turmeric is a flowering plant, Curcuma longa belonging to the ginger family, Zingerberaceae. The roots of turmeric are used in households for cooking purposes. Turmeric powder is generally adulterated with rice powder, wheat powder etc. giving the powder a superior pale color. For brightening the powder, lead chromate (poisonous chemical) is often added to the powder.

(I)Detection of Lead Chromate

Chemicals required - Concentrated HCL and 1% diphenyl carbazide in revised spirit.

Procedure:

* 1g of the turmeric powder sample was taken in a test tube.
* 5 ml of concentrated HCL was added to it.
* 1 ml of 1% diphenyl carbazide was added to the mixture.

SAMPLE 2: Detection of Vegetable ghee in Milk Products

Regional ghee, is a milk product which is costlier than vegetable ghee. Hence, regional ghee is often adulterated with vegetable (vanaspati) ghee. Vegetable oil comprises of sesame oil, which is not present in regional ghee. Sesame oil generally reacts with the mixture of concentrated HCL and furfural solution to give off red color. This test is famous by the name of ‘Baudouin test’.

Chemicals Required – Concentrated HCL and 2% solution of furfural (C4H3OCHO ) in alcohol.

Procedure:

* 5 ml of melted ghee sample was taken in a test tube.
* 5 ml of concentrated HCL was added to it.
* 2-3 drops of 2% solution of furfural was added in alcohol.
* The mixture was shook and was allowed to stand for almost 10 minutes.

SAMPLE 3: Detection of Washing soda, chalk powder, various insoluble substances in sugar

Sugar is the generic name for soluble carbohydrates. From its use in households to its use in manufacturing of sweet products, its very common in our day to day life.

Chalk powder is a water insoluble substance which is often found in sugar as an adulterant. Furthermore, sugar is also contaminated using washing soda.

(I)Detection of different insoluble substances

Procedure:

* Small amount of sugar was taken in a test tube and was shook with addition of little water.

(II)Detection of chalk powder, washing soda

Chemicals required – Dilute HCL

Procedure:

* Small amount of sugar was taken and few drops of HCL was added and observed.

SAMPLE 4: Detection of Red colored salts in chili powder

Chili powder sold in the market is time and again adulterated with red colored lead salts and brick powders.

Chemicals Required – Dilute Nitric Acid (HNO3), Potassium Iodide(KI)

Procedure:

* Sample of chili powder was taken in a test tube.
* Dilute HNO3 was added to the sample.
* The solution was filtered and few drops of KI was added to the filtrate.[6]

**Findings**

For Sample 1

|  |  |  |  |
| --- | --- | --- | --- |
| Lead Chromate Test | | | |
| S.N. | Experiment | Observation | Inference |
| 1 | Mixture of powder,  conc. HCL and diphenyl carbazide was mixed ,shook and allowed to stand | Pink to red color wasn’t observed. | Absence of lead chromate inclines toward no adulteration of turmeric powder. |
| Pink to  red color was observed | Presence of lead chromate confirms the adulteration of turmeric powder. |

For Sample 2

|  |  |  |  |
| --- | --- | --- | --- |
| Baudouin test | | | |
| S.N. | Experiment | Observation | Inference |
| 1 | 5 ml of conc.HCL was added in 5 ml of melted ghee sample and 2-3 drops of alcoholic furfural was added , shook and allowed to stand | Rose red color wasn’t observed | Absence of vanaspati ghee infers that the regional ghee is unadulterated. |
| Rose red color was observed. | Presence of Vanaspati ghee infers that the regional ghee is adulterated. |

For Sample 3

|  |  |  |  |
| --- | --- | --- | --- |
| Solubility Test | | | |
| S.N. | Experiment | Observation | Inference |
| 1 | Small amount of sugar was taken in a test tube and shaked with little water | Sugar dissolves in water. | Absence of insoluble impurities constitute the sugar is unadulterated. |
| Sugar doesn’t dissolve in water. | Presence of insoluble impurities constitute the sugar is adulterated. |

|  |  |  |  |
| --- | --- | --- | --- |
| Chalk Powder, Washing Soda Test | | | |
| S.N. | Experiment | Observation | Inference |
| 1 | Few drops of dil.HCL was added to a small amount of sugar in a test tube | Effervescence of carbon dioxide isn’t observed. | It implies that the sugar is unadulterated. |
| Effervescence of carbon dioxide is observed. | It implies that the sugar is adulterated. |

For Sample 4

|  |  |  |  |
| --- | --- | --- | --- |
| Chili Powder Test | | | |
| S.N. | Experiment | Observation | Inference |
| 1 | Dil. HNO3 was added to a sample of chili powder and solution was filtered and few drops of KI were added to the filtrate | Yellow ppt. wasn’t observed | Absence of lead salts implies that the chili powder is unadulterated. |
| Yellow ppt. was observed | Presence of lead salts implies that the chili powder is adulterated |

**CONCLUSION**

I have studied different chemical reactions with regard to the process of identification of various kind of adulterates in food products. The above experiments were performed for the purpose of detecting different adulterates present in common food.

With the increasing rise of food-borne diseases, it becomes more crucial than ever to run such kind of tests so as to verify the quality of products being sold to the population. These tests should be initiated more frequently especially in urban areas. The public should spread awareness and the state members must push the idea of identification of adulterates. All of the combined efforts will help us to tackle the unethical business of food adulteration and make our nation healthier, more prosperous.

**REFERENCES**

1.

https://web.archive.org/web/20171014020206/http://www.farmersbranch.info/DocumentCenter/View/2586

2.

https://apps.who.int/iris/bitstream/handle/10665/121784/em\_RC46\_6\_en.pdf?sequence=1&isAllowed=y

3.

Shrestha B. “Lead-Laden Noodles Still Being Sold” Rising Nepal Daily 2021

4. Adhikari S., “Food Adulteration, Types of Food Adulteration and Mitigating Measures”, 2018

5.

Coley N., "The fight against food adulteration", Education in Chemistry, 42(2), 46-49

6.

Deka T. “Detection of Adulterants in Common Food Stuffs” Research Gate 2011-12, 9-14

~THE END~