

Food Adulteration and Its Various Facets

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Abstract

Food is necessary for life to sustain itself. Everybody eats to obtain energy for various metabolic processes. Food is necessary for the growth, maintenance, repair, and upkeep of all living things. There are many different kinds of food on the market today, and we all rely on different kinds of food on a daily basis, such as fruits, vegetables, grains, pulses, legumes, and so on. Natural food products being contaminated or adulterated is one of the biggest problems facing modern society. In poor nations, adding adulterant is a frequent practice despite numerous penalties and sanctions. Natural products can be adulterated in a number of ways. Adulteration impacts practically all food items and happens on a worldwide scale in a variety of ways. In addition to being a significant economic concern, adulteration can have a negative impact on customers' health. The sophistication of food adulteration techniques has led to the need for highly effective and dependable procedures for identifying fraudulent manipulations. This review paper analyses the various facets of food adulteration occurring around us all the time and offers solutions to tackle the same in future.

Keywords: Food adulteration, facets, challenges, impact, solutions.

Introduction

Food, which is made up of carbs, water, fats, and proteins and can be consumed by humans and other animals for both sustenance and enjoyment, is one of the essential necessities for all living things. (FAO/WHO 2007). The majority of food spoiling happens during handling from primary producers to final consumers. Therefore, the general public should be aware of basic screening tests. Food adulteration is the process of lowering or reducing the quality of food by substituting ingredients, adding unauthenticated substances, or removing essential components for financial gain or unrelated causes. (Gahukar, 2014). In the end, food adulteration deceives customers and poses a number of health hazards. These days, it is quite challenging to locate a food market segment that is free of adulteration. Because of this, it's critical for consumers to understand common adulterants and how they affect their health. This is because there are more and more food producers, and the volume of food they import allows them to deceive and mislead customers. Chemicals known as adulterants are something that shouldn't be in our diet (Anita and Neetu, 2013).

Consumer interest in the safety and traceability of food items has grown as a result of the dramatic rise in adulterant usage in recent years. The country's food safety standards were established by the Prevention of Food Adulteration Act, 1954, which also specified what constitutes adulterated food. A food article is deemed adulterated if one of the following conditions is met:

- a. the item sold by a vendor is not of the nature, substance, or quality that the buyer has requested or which it purports to be;
- b. the item contains any substance affecting its quality or is processed in a way that adversely affects its nature, substance, or quality;
- c. The article has been replaced entirely or partially with a cheaper, inferior substance;
- d. The article has been prepared, packed, or stored in an unhygienic manner, resulting in contamination or health hazards;
- e. The article is entirely or partially composed of any disgusting, putrid, rotten, decomposed, or diseased animal or vegetable substance; or it is infested with insects or otherwise unfit for human consumption;
- f. The item was derived from an unhealthy animal;
- g. It contains any poisonous or harmful ingredient that could be harmful to health;
- h. The item's container is made of any harmful or poisonous material that could be harmful to health;
- i. The item contains any prohibited colouring or preservative, or any permitted colouring or preservative that exceeds the recommended limits;
- j. The item's quality or purity is below the recommended standard, or its ingredients are present in amounts that are not prescribed, whether or not this makes it harmful to health.

Various incidents of adulteration in past

1. The Canadian government issued a warning to its residents in September 1998 about the possibility of argemone contamination in any product cooked or processed in Indian oil.
2. Artificial chemicals and detergent powder are being added to milk, which could result in permanent harm. It's referred to as synthetic milk in the trade. In May 2000, the Delhi police confiscated 76,000 litres of tainted milk, which were packaged in pouches resembling those used by Mother Dairy, which is owned by the esteemed National Dairy Development Board.
3. In other locations, such as Bangalore, milk's fat is extracted and subsequently sold after being combined with toxic chemicals to thicken and whiten the weak liquid.
3. Beautifully adorned candies and other food items (such as "Ultra Marine Blue," "Rhodamin-B," "Metanil Yellow," or "Kishori Rang," which is a prohibited coal tar dye). These are all prohibited and forbidden colours that pose major health risks and have the potential to eventually lead to cancer. They cause cancer (Ghosh, 2012).

However, economic adulteration is currently a persistent issue that has the greatest impact on the food industry. In a survey, adulteration was found in milk to the extent of 70% with water, 43% with chalk powder, 100% with artificial colouring, and 37% with chalk powder for sugar, turmeric powder, and red chilli powder, among other combinations.

History

German scientist Frederick Accum conducted the first investigation into adulteration use in 1820 after finding numerous harmful metal colonisations in drink and food. Food suppliers were displeased with his job, and a scandal involving his purported mutilation of the book "The Royal Institution Library" finally led to his downfall. The 1860 Food Adulteration Act and other laws were the result of the comprehensive research done by physician and author Hill Hossal in the early 1850s, which were published in the Lancet (Ghimire, 2016).

Why some people choose adulteration?

According to Afzal et al. (2011), adulteration is mostly drawn to increase financial income through volume. The primary cause of adulteration is dishonesty and a lack of inadvertent quality assessment on suspected products, even though certain self-centered producers, processors, and retailers started adulteration in order to increase their profit margins (Asrat and Zelalem, 2014). Food is frequently tampered with in order to feed the vast population and meet the demands of the world's rapidly expanding population. Outsourcing to overseas producers is another reason for adulterating and falsifying goods and services (Hamburg, 2010). According to Narayan (2014), there are six major reasons for adulteration in food items as follows:

1. boosting their cash income by increasing its volume.
2. dishonesty and lack of accidental quality assessment on products suspected
3. To meet the needs of growing population. Another motive for faking and adulteration of goods and services is outsourcing to offshore producers.
4. comparatively labour is cheap in some countries and this is also what makes product faking easy since the cost of producing is far less compared to the super normal profits being made
5. when the demand is more than the supply in the market
6. the greed for increased profit margins,
7. the common man cannot afford food items with their original constituents,
8. lack of trained manpower with outdated food processing techniques and
9. No idea about the disease outbreaks caused due to adulterated food products.

Types of Food Adulteration

Although there are various ways to adulterate food, there are essentially two kinds of adulterations. There are intentional/deliberately/knowingly and unintentional/unknowingly/incidental adulterations, according to El-loly et al. (2013).

Deliberate adulteration

It is a purposeful adulteration of food items, known as deliberate adulteration. It is the addition of subpar materials with characteristics resembling those of the foods to which they are introduced. As such, it is challenging to find them. The adulterant may have a biological or physical character. For example, they could add chemicals like urea or melamine to boost their profit margin, or they could add starch, flour, cane sugar, vegetable oils, water, etc. to expand the volume. It is the most harmful type of adulteration because it involves the removal of nutrients and the addition of unnecessary substances to food products by business-oriented individuals who have forgotten about humanity (Awasthi et al., 2014).

Unintentional/Incidental adulteration

Adulteration is the result of food goods and beverages not being kept in appropriate hygienic conditions from the production site to the consumption table. Inadvertent adulterants include foodborne parasites, chemical residues, and rodent droppings. Accidental metallic contamination with lead, mercury, and arsenic is also possible. Pests like rats and insects are also unintentional adulterants (Pandit et al., 2002).

Various food items and their adulterants

Nearly all food items, including cereals, fruits, vegetables, and milk, are contaminated in some way. Because farm stairs are not well cleaned, certain adulterants infiltrate through them. These are obvious

adulterants, such as dust, sand, gravel, leaves, and stones. It is less dangerous since the consumer can clean them.

Milk & milk products adulteration

With the onset of industrialization, population expansion, and urbanisation, there was a sharp rise in demand. The rising demand for milk was no longer being fulfilled by the supply coming from small farms. The process of adulterating milk entails diluting it with water and eliminating its healthy fat content. Frequently, ghee is added to butter and soy milk, starch, groundnut milk, and wheat flour are added to milk (ESA, 2012).

Adulteration of Fats and Oils

Oils and fats are easily adulterated. Paraffin wax, castor oil, and hydrocarbons make up the majority of fats, oils, and butter. However, spotting this kind of adulteration is challenging.

Food Grain Adulteration

It entails combining crushed stones or sand to make food grains heavier. Plastic beads that mimic the colour and size of grains are combined with cereal grains and legumes. To add to the weight, grains are frequently sprinkled with water as well.

Other Adulterations

Adulteration of other foods (those originating from plants and animals) is commonplace; for instance, hot chilli powder is frequently combined with brick powder, and tea leaves are frequently combined with leftover tea leaves. Also, honey can be tampered with using less expensive sweeteners; sugar syrups and molasses that have been reversed by acids or enzymes from corn, sugar cane, sugar beet, and naturally occurring syrups like maple have all been found in tampered honeys. In recent years, there has been a significant increase in the adulteration of pure honey with synthetic honey (based on C4 plant sugars). Furthermore, there has been a significant adulteration issue with Far Eastern honey recently (Pilizota and Nedic, 2009).

Impact of Food Adulteration

Due to improper handling brought on by adulteration issues, food items utilised in our daily lives are unsafe to eat and unclean (Asrat et al., 2012). Food adulteration has grown to be one of the major issues in recent decades, and eating food that has been tainted can lead to major illnesses like cancer, ulcers, diarrhoea, and asthma. In general, food adulteration has a very negative effect on farmers, producers, processors, manufacturers, consumers, and the government.

Impact on commercial enterprises

Businesses are affected by a decline in customer trust in their offerings, product recalls and destruction of tainted goods, costs associated with filing complaints, rising insurance rates, and fees for replacing or cleaning equipment. A supplier's error is bound to be publicised in the media, tarnishing the company's image. This has an impact on many other products' sales in addition to the sales of that specific product (Pandpal et al., 2012).

Impact on farmers/producers

Adulteration affects not just large corporations but also farmers or producers of goods (dairy, honey, coffee, wheat, etc.) as the weakest link in the industrial chain can have an impact on them. Numerous farmers experienced severe financial losses, rising feed prices, a scarcity of milk cows as a result of mass sales or slaughter during the crisis (as was the case with the China dairy scandal), and a lack of demand for their goods (Qian et al., 2011 and Nie, 2008).

Impact on consumers

Food adulteration has a very sensitive effect on human health. Food adulteration has been linked to harmful side effects such as anaemia, sleeplessness, diarrhoea, vomiting, nausea, vision problems, headaches, and cancer as mentioned by Anita and Neetu (2013), Faraz et al. (2013) and Lakshmi et al. (2012). Ex: In 1988, rapeseed oil tainted with tricresyl phosphate—a substance often found in hydraulic fluid and varnishes—caused paralysis in 600 people in Kolkata, West Bengal.

Safety measures to be taken by various stakeholders**Producers and manufacturers**

- Adopting good agricultural practices (GAP), such as integrated pest management, is necessary at the field level to prevent food contamination of agricultural produce before and after harvest (Kumar and Popat, 2010).
- Need-based applications of safe and advised pesticides should take the place of excessive and careless dosages of synthetic fertilisers and pesticides.
- In manufacturing industries, the most practical way to prevent chemical contact is to wear personal protection equipment (PPE), wear gloves, and wash your entire body after work.
- Poisonous effluent dumping in industrial regions must be prevented; stipulated rules, including antidotes and preventive measures, must be implemented (Gahukar, 2011).

Consumers

- Admixture can be avoided when buying food, by implementing easy measures at the home, and by informing the appropriate authorities.
- It is best to inspect food grains when making a purchase, and only branded and ISI-marked goods ought to be chosen.
- To vary the maturity, buy fruits that are just a little bit underripe but not overripe. Spices, condiments, and whole grains (cereals and pulses) can all be manually arranged at home.
- Peeling apples helps eliminate the wax layer that contains harmful substances.
- You may remove more than 90% of the toxicity from grass pea grains by parboiling them and then washing them in fresh water.
- Foods in cans should only be purchased after the expiration date has been verified, and exposed foods, ice, and juice should never be purchased.

Role of Government Agencies

Rigorous market surveys

Health authorities can monitor illicit activities related to the presence of ethylene or oxytocin in fruits and vegetables, as well as dyes or acids in edible oil. Declaring the colour on the container label is required.

Inspection and testing

The current food chain is efficient, adaptable, and complicated, but its infrastructure is dispersed and lacking, making it difficult to inspect and test. Because of this, there are very few true channel masters who are able to oversee logistical operations, coordinate the entire supply chain, and control the supply-demand situation.

Regulation and certification

Food adulteration is frequently associated with contaminants in the grains sold through the Public Distribution System (PDS), the sole central government-run food supply organisation. There is insufficient enforcement of the regulations, and the majority of state governments lack the resources necessary to periodically do checks.

Conclusion

Food adulteration can have a significant negative impact on health without our knowing. A few precautionary measures taken by our civilization can stop it. Government oversight should be applied to food price increases. Food should not be purchased from establishments that do not uphold adequate hygienic standards. Government agencies ought to conduct inspections of both regional and national food retailers. We can ensure that future generations lead healthy, non-adventurous lives if we actively contribute to these developments.

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