

FOOD ADULTERATION: A SERIOUS HEALTH THREAT TO HUMAN KIND

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Abstract:

Food is essential for the sustenance of life. We all eat food and gain energy for different metabolic activities. All living organisms need food for growth, work, repair, and maintaining life processes. There are different types of food available today in the market, and on a daily basis, we all depend on various food sources, including vegetables, fruits, cereals, pulses, legumes, etc. As we buy fresh veggies and other groceries, we might come across small pebbles in cereals and grains, darkly stained vegetables like cabbage, broccoli, fruits, dark red meat, and a lot more. Adulteration or contamination of natural food products is one of the major challenges in today's society. Despite various actions and penalties, the practice of adding adulterants or the process of contaminating food or adding to food components is a common phenomenon in developing countries. Adulterants are substances or poor-quality products added to food items for economic and technical benefits. The addition of these adulterants reduces the value of nutrients in food and also contaminates the food, which is not fit for consumption. These adulterants can be available in all food products which we consume daily, including dairy products, cereals, pulses, grains, meat, vegetables, fruits, oils, beverages, etc. Adulteration is being done deliberately like adding certain chemicals for faster ripening of fruits, mixing decomposed fruits and vegetables with the good ones, adding certain natural and chemical dyes to attract consumers, and cheaper and inferior substances added wholly or partially with the good ones to increase the weight or nature of the product. Adulteration is an illegal practice of adding raw and other cheaper ingredients to excellent quality products to increase the quantity. Having this adulterated food is highly toxic and leads to several health issues, including certain nutrition deficiency diseases, kidney disorders, and failure of an individual's organ systems, including the heart, kidney, and liver.

Keywords: Food, Adulteration, Food Adulterant, Toxic, Disease

INTRODUCTION

Food is one of the essentials of life and it must be wholesome and free from adulteration for proper maintenance of health. Adulteration [1] is the act of degrading food quality by incidental or intentional means through the addition of chemicals, extraneous matter, etc. [2] In a country like India where there is a huge population to feed and there is lack of monitoring of what reaches the consumer, the act of adulteration isn't quite surprising. Items of daily consumption like grains and milk, etc. are being adulterated for the selfish interest of food vendors for monetary gains and not only compromises on the health of the consumer but also results in wastage of food which are discarded if found adulterated. The country which faces a gap in the supply and demand goes several steps back again due to this. Quite unknowingly, most of the times, the food vendors indulge into such malpractices with callous disregard to the health interests of the consumer by all possible means. Food safety is an aim to bring safe and nutritious food to the plate of the consumer [3]. Hence the prime objective of food is not sufficed due to the menace created by food adulteration. adulterated by food laboratories and those foods go into waste as they are unfit for consumption. Thus, in this way, the food grown by the farmer by use of a multitude of resources doesn't reach the consumer or makes way to his plate as a poison. This is a clear case of food wastage and violation of the interests of the consumer who pays for the product as well the farmers who work hard to grow the crop. In a country of 1.3 billion people and where a massive chunk of the population struggles to get two square meals a day and remains unfed there a large proportion of food grains produced ends up in the bin, it is ironical how such a situation has now become a reality. Unfortunately, it is the middlemen who finally earn profit from such heinous acts. Thus, there stands a need to take a strict control over the food items sold to the consumer and also address the major causes behind food adulteration so that it can be brought down to nil and instead there is protection given to the customer in terms of provision of safe foods. Not to disregard, that such efforts will also alleviate food adulteration and prevent food wastage.

The reasons for adulteration in food are mainly as follows:

1. For earning more profits by mixing a cheaper and easily available substance in a similar but costlier food.
2. Contamination of a substance due to the negligence or account of an inadequate knowledge in the field.
3. Un-awareness of government laws at manufacturer's/seller level with regard to adulteration in food.
4. Un-awareness of a consumer regarding acceptability of adulterated food.
5. Inadequate supply of essential food.

FOOD

Food in simple terms mean: what we eat to satisfy the appetite and to meet the demand of calories and other nutritional requirements [4]. Food serves the following broad purposes.

- Growth
- Supply of energy
- Reproduction
- Maintenance and Repair
- Psychic needs such as pleasure and appetite satisfaction.

The function of the food is served through the various nutritionally important food components, namely

- Fat
- Proteins
- Carbohydrates
- Minerals and
- Vitamins

But, as per PFA Act,[5] "Food" means any article used as food or drink for human consumption other than drugs and water and includes:

- Any article which ordinarily enters into, or is in the composition or preparation of, human food.
- Any flavouring matter or condiments, and
- Any other article in which the Central Government having regard to its use, nature, substance declare, by notification or quality, in the official Gazette, as food for the purpose of the PFA Act.

FOOD ADULTERATION

According to PFA Act,1954 [5], Adulterant means any material which is or could be employed for the purpose of Adulteration. Food adulteration with poisonous chemical like formalin is widespread and regularly applied on fish [6]. To save ourselves and our descendants, we have to fight all together against these ill trends of adulteration. Food adulteration has become a very common practice in our country and we are consuming these foods almost every day, which have numerous harmful effects to our health. Food adulteration means anything adding or subtracting with food making it injurious to health. This adulteration may be done intentionally or unintentionally. Intentional adulteration is a criminal act and punishable offense.

Food adulteration with poisonous chemical like formalin is widespread and regularly applied on fish, fruit, meat and milk that causes different types of cancers, asthma and skin diseases

[7]. Colouring dyes, calcium carbide, urea, brunt engine oil and even some permitted preservatives are used in excessive amount that affect multiple organs of human body [8]. Mostly it causes cancer like colon, peptic ulcer diseases, chronic liver diseases including cirrhosis and liver failure, electrolyte imbalance and eventually kidney failure. Heart diseases, blood disorders and bone marrow abnormality are also detected [9]. Chance of malignancy increases and neurological impairment or brain functions are also often compromised. Skin problems are frequently seen including allergic manifestation [10].

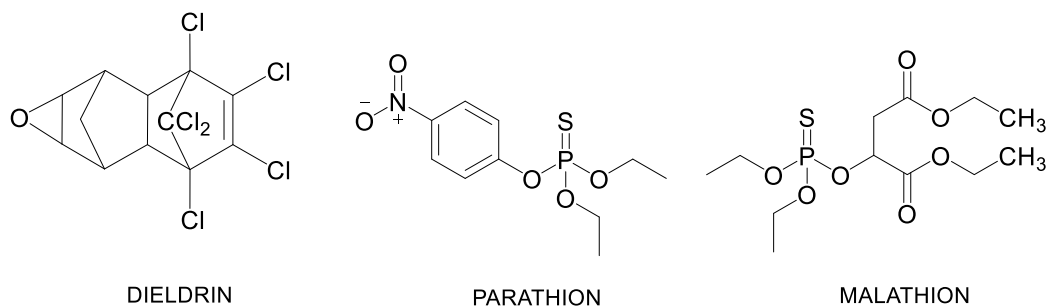


Figure 1: Some organic compounds which are being used as Pesticides.

We know it is a punishable offence and it creates health hazards and can kill human being, even then we forget everything just for business interest. Now to save ourselves and our descendants, we have to fight all together against these ill trends of adulteration. Government should also take serious action with tougher law against those culprits. We all should make aware the general people about the serious health impact of taking adulterated food. Such sincere community resistance can alter the scenario and we need to do it right now. Take care of your food means taking care of your health.

Food & drink items	Adulterant substances	Purpose of Adulteration	Types of Adulteration
Ghee	Vanaspati, anatta, & oleomargarine	To make more yellow	Deliberate
Milk	Water, skim milk	To increase volume	Deliberate
Condensed milk	Paneer, khoya	To give rich texture	Deliberate
Butter	Vegetable oil, anatta, banana, oleomargarine	To increase volume & make yellowish	Deliberate
Ice cream	Starch, rice powder or wheat flour	To thicken cream	Deliberate
Tea leaves	Black/Bengal gram dal husk with colour	To add colour	Deliberate
Red wine	Juice of bilberries	To produce deep blue ppt with lead acetate	Deliberate
Mustard oil	Papaya seeds	To add bulk and weight	Deliberate
Black pepper	Papaya seeds	To add bulk	Deliberate
Green chillies & peas	Malachite green	To give bright glow green colour	Deliberate
Chillies powder	Brick powder	To increase weight	Deliberate

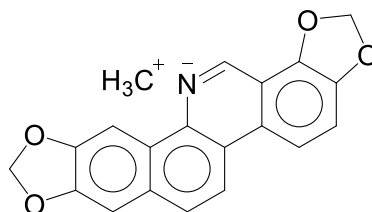
Sugar	Chalk powder, washing soda, urea	To increase amount	Deliberate
Oil	Rancid oil	To increase volume	Deliberate
Coriander powder	Cow dung powder	To increase amount	Deliberate
Pulses	Lathyrus sativus	To increase weight	Deliberate
Common salt	White powder stone, chalk	To increase amount	Deliberate
Coffee	Chicory, roasted barley powder, tamarind seeds	To add bulk and colour	Deliberate
Honey	Molasses, cane sugar	To increase volume	Deliberate
Wheat	Ergot (poisonous fungus)	To increase weight	Deliberate
Jaggery	Chalk powder	To increase amount	Deliberate
Preservatives	Formalin	To increase shelf life	unintentional

Table 1: Different food items and their adulterants and the purpose of adulteration [11]

FOOD ADULTERATION CAUSING HEALTH THREAT

EPIDEMIC DROPSY

Epidemic Dropsy occurrence is common in some parts of the country and it was witnessed in Delhi and neighbouring states witnessed which caused many hundreds of lives in the months of August and September 1998 [12]. Due to contamination of mustard oil with argemone oil which contain a toxic alkaloid, sanguinarine [13]. The sanguinarine interferes with the oxidation of pyruvic acid which accumulates in blood. Seeds of Argemone Mexicana (Poppy Weeds) closely resemble mustard seeds which can be easily mixed with mustard seeds. It was observed that a sudden onset of non-inflammatory swelling of legs, glaucoma, nausea, vomiting, diarrhoea, fever, dyspnoea, cardiac failure and death may occur in 5-50% of cases [14]. There is an occurrence of erythematous mottling and raised haemangiomas on the skin and mucous membrane. Consumption of contaminated oil may affect anybody and can cause serious health issues.



SANGUINARINE

Figure 2: Structure of Sanguinarine found in Argemone oil.

CANCER DISEASE

Generally, we think that only tobacco is the major factor behind cancer and cancer related mortality [15], but there are other factors like viruses and bacteria and also ultraviolet and ionising radiation [16]. Currently as we are witnessing increase in cancer's patients and

humans are completely ignoring that even food adulteration can eventually cause cancer disease. Turmeric powder which is known as natural herb can cure several diseases, who would have thought that this could also lead to disease like cancer [17]. It is generally adulterated with pesticide residues, industrial dyes like Metanil yellow and carcinogenic metals like arsenic and lead. Metanil yellow also responsible for the paralysis. Similarly, chilli and coriander powder that we are consuming regularly are contaminated with redbrick powder, some non-permitted dyes like rhodamine-B and water-soluble synthetic colours which lead to metal toxicity, cancer, lead poisoning, tumour, and also variation in blood pressure has been observed [18].

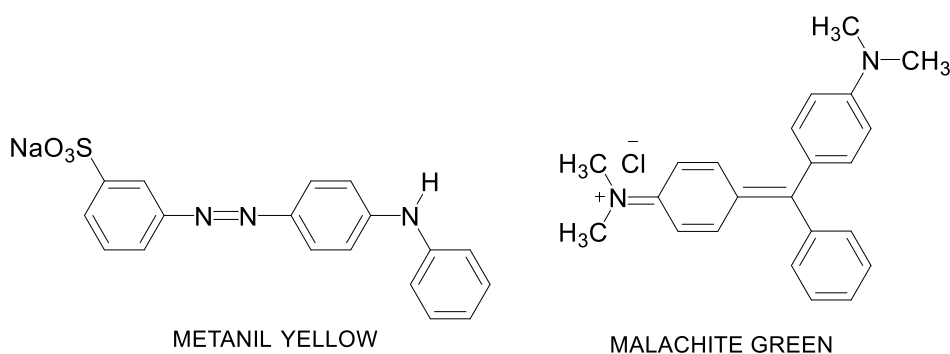


Figure 3: Common synthetic food colours.

STOMACH DISORDERS

Stomach disorders is very common in everyday life due to intake of adulterated food items like milk and curd, which generally adulterated by starch powder, urea, water and sometime sugar also to make it sweet, whereas market sugar and jaggery itself contaminated by chalk powder and washing soda [19]. Fruits and vegetables are very essential food items that we should intake for the fulfilment of nutrients but there are reports that chemical dyes like malachite green is being used for making it look good while calcium carbide to ripen it early [20]. Our body try to discard these adulterated foods by vomiting. Long-term use of these adulterated food items can even lead to gastro-intestinal disturbance. And in severe case, liver damage can also be possible.

SKIN DISEASES

Skin diseases are conditions that affect your skin. These diseases may cause rashes, inflammation, itchiness or other skin changes. Skin diseases and cancer caused due to intake of fish, fruits, meat or milk adulterated with chemicals like formalin [21]. Adulterants like dried papaya seeds and blackberries are being using in pepper which cause severe allergic reactions and including stomach and skin irritations [22]. Contaminated edible oils may also causes allergies, paralysis and increased LDL cholesterol and the adulterants which are presents in edible oils are mineral oil, Karanja oil, castor oil and artificial colours [23].

HEART DISEASES

Diet is an important risk factor in coronary heart disease. Food-related risk factors include obesity, high blood pressure, uncontrolled diabetes and a diet high in saturated fats. Edible oil is the primary reason for heart related problems and now days these edible oils are being adulterated by mineral oil, Karanja oil, castor oil and artificial colours which enhance the possibility of cardiac arrest [24]. Excessive use of common salts as adulterants in our daily diet can lead to high blood pressure, heart disease and stroke [25]. Ice-cream business has increased rapidly over the years but we are unaware of the adulterants presents in it like Pepper oil, ethyl acetate, butyraldehyde, nitrate and washing powder which impact directly on our heart and can also cause dreadful disease that affect organs including lungs, kidneys [26].

METAL TOXICITY

There is a wide range of foods contaminated by heavy metals, including products of plant origin (cereals, rice, wheat, edible roots, mushrooms, etc.) as well as foods of animal origin (fish, crustaceans, molluscs) [27]. These foodstuffs are the most important part of the human diet, because they can provide the body with protein, vitamins, carbohydrates, calcium, iron, and other essential micronutrients (such as Cu, Zn) [28]. Therefore, the intake of various foodstuffs has become the main source of the nutrients, but also a route for the pollutants to enter into the human body. And the excessive of exposure to Heavy metals which bind to parts of our cells that prevent your organs from doing their job. Symptoms of heavy metal poisoning can be life threatening and they can cause irreversible damage.

DIARRHOEA

Diarrhoea is caused by contaminated food. Symptoms of diarrhoea include frequent, loose, watery stools and stomach pain. Some infections may need antibiotics [29]. Severe cases can cause enough dehydration to require intravenous fluids. Mostly coffee powder and jaggery which are being consumed by us in which food adulterants like Chicory, tamarind seeds powder and washing soda and chalk powder are present respectively [30]. Diarrhoea can have causes that aren't due to underlying disease. Examples include a liquid diet, food intolerance, stress, anxiety or use of laxatives.

CONCLUSION

The study brings out a clear picture of the present scenario of food adulteration in India. It also highlights what are the main areas on which the government should focus so that the menace of food adulteration can be put to control. Through the cause analysis, it is clear that the major areas India should focus on is to combat intentional food adulteration for economic benefits, as most of the cases of non-compliance were due to that. The ignorance and selfish interests of the middlemen have led them into such malpractices.

The key points that rose out of this study is as followed:

- Education and regulation go hand in hand.
- Prevention of food adulteration in turn prevents food wastage.
- Digitalization and improved technology can revolutionize the present scenario of food safety.

It requires close monitoring and strategic planning to combat such a wide spread problem. But the boon at present is the rapid advancement of technology which can be utilized to against food adulteration. Food safety apps for consumers, improved labs under the government and trained personnel for supervision will together form a great weapon to fight food adulteration.

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