



Adulteration in Food Products: a Review

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Abstract:

Food adulteration is major problem faced by food industry. Increasing profitability is common motive behind the adulteration practices. It is very important to have stringent norms and standards for controlling adulteration. According to various investigations there is hardly any left without adulteration. The food items like milk and its derived products, honey juices, organic foods, coffee, and some highly processed foods are more prone to adulteration. Various investigators have carried out research for identification and detection of adulterated food and other items. The present review summarizes research carried out in the field of adulteration

Keywords:

Public health; food security; analysis; characterization; detection

Introduction

Food security for all human beings is being considered the most important aspect of development. The need brings about innovations. There has been significant growth in the industrial sector. Food industry is no exception to this. Various high quality foods with durable properties are the need of hour. Various food preserving methods have increased the use of milk powder, organic food and readymade items. The innovations have their other side also. Similar looking material with good adhering and mixing properties are identified by adulterators to increase the profit. This is not only cheating

but sometimes can be fatal also. The investigators have studied various aspects of adulteration, its identification, analysis and awareness among people. The present review summarized these research studies.

Studies on Adulteration

Bhatt et.al studied impact of media and education on food practices in urban area of Varanasi [1]. They prepared a questionnaire and distributed it among selected people depending on their age group, sex and educational background. Their study indicated that regardless of the age income and religion, all of the groups are well aware the food adulteration and educated people are less prone to the effect. It was observed that all the stores contain adulterated food. Branded items are less prone to adulterations. Alauddin carried out studies on food adulteration and its effect on society [2]. According to him poor monitoring has led to food adulteration from ancient times. Sometimes the usage of adulterators has even extended to exceedingly dangerous chemicals and poisons. He stated that global market of adulteration and fake goods is more than several hundred billion dollars which constitutes more than 10 percent of total trade. While in India this percentage is 30 percent. Branded items like parachute oil, fair and lovely cream, Vicks and dabur amla oil have more than 100 duplicates in the market. This adulteration is very lethal if done in food items. According to him, 90 percent of un branded food items are adulterated. Food



additives, pesticides, colouring agents and various taste enhancers are many time dangerous for human health. Shelar et. carried Evaluation of edible oils for Argemone mexicana seed oil adulteration [3]. Sanguinarine and dihydrosanguinarine are toxic principles (alkaloids) present in argemone oil. In their investigation, they made attempts to evaluate argemone oil adulteration in different edible oils. They evaluated adulterated and unadulterated edible oil samples for primary quality control parameters and further subjected for instrumental analysis like FT-IR, GC-MS and HPTLC. They found the HPTLC method was well suited for separation of toxic principles like sanguinarine and dihydrosanguinarine present in comparatively small proportion in adulterated samples. Gautam & Singh studied hazards of new technology in promoting food adulteration[4]. According to them, ugly face of food adulteration come out in the form of its harmful effects as stomach disorder giddiness and joint pain, diarrhea, liver disorder, dropsy, gastrointestinal problems, respiratory distress, oedema, cardiac arrest, glaucoma carcinogenic effects, paralysis etc. Various studies indicated that milk adulteration upto 70 percent, turmeric powder-43% with chalk powder, red chilli powder-100% with artificial color is practiced. It was also revealed that About 28% urban children of age group 6-18 have been affected by headache. In India some 4, 00,000 children below five years age die each year due to diarrhea, according to National Institute of Nutrition. Ali presented a regulatory on food safety and public health issues in Bangladesh[5]. According to him, adulteration problem persists at every level of the food chain from preparation to consumption. According to him, food manufacturers, processors, restaurants, fast food outlets and so forth are all involved in one way or another in this corrupt practice of adulteration. He also observed that food was adulterated by various

harmful chemicals and toxic artificial colour , and rotten perishables turned to poisonous foods are stored, sold and served to consumers in an unhygienic atmosphere. Sudershan et.al. reviewed food safety research in India[6]. They found that many studies were focused on detection of pathogenic microorganisms, adulterants and contaminants in food. According to him in developed countries the need of making available food to large population makes it difficult to curbe the adulteration menus. He found that there have been hardly any studies to evaluate the risks posed by adulterants, additives and contaminants to the health of consumers. He concluded that serious focus on risk assessment, early warning/rapid alert situations was needed. Nasreen and Ahmed discussed food adulteration and consumer awareness in Dhaka city from 1995 to 2011[7]. They reviewed results of food sample testing by public health food laboratory of Dhaka City Corporation. They found that 40-54% of daily-consumed food was adulterated during 1995-2011. The proportion of adulterated food decreased during 2001-2005. Also it was observed that only 11 percent consumers cared about approval for a product from authorities. Kamthania et. al. studied methods of detection & remedial measures for milk adulteration[8]. They used Six commercial bovine milk samples from the national market and four dairy beverage samples of cappuccino, chocolate, and banana and strawberry flavors. They pretreated the samples with trichloroacetic acid (TCA) to precipitate casein and major whey proteins. Kartheek et.al. reviewed determination of Adulterants in Food[9]. They proposed the use of the least-squares support vector machine (LS-SVM) as an alternative multivariate calibration method for the simultaneous quantification of some common adulterants. They used Chemo metric MID-FTIR methods to detect and quantify the adulteration of mince meat with horse meat, fat beef



trimmings, and textured soy protein. They developed a SIMCA (soft independent modeling class analogy) method to discriminate between adulterated and unadulterated samples. According to them, WT-LS-SVM can be as a rapid screening technique for detection of this type of honey adulteration with good accuracy and better generalization. Cordella et.al. studied recent developments in food characterization and adulteration detection[10]. They reviewed mainly publications that appeared in analytical abstracts (Royal Society of Chemistry) from January 1990 to February 2001. The review discussed microscopic analysis techniques like HPLC, GC, GC-(MS, FTIR); UV-visible spectrophotometry; AAS/AES, ICP-(AES, MS); IRMS, GC-IRMS, GC-C-IRMS; DSC; IR, mid-IR, and NMR. They discussed two approaches namely global approach and a chemical compound approach. According to them, chromatographic techniques such as HPLC and GC (and their coupled variants) are particularly well adapted to the characterization of the food from a molecular point of view. Global approach includes spectroscopic techniques such as atomic absorption (AAS, AES, ICP-AES, etc.) .Thakur et.al. discussed impact of health education package on knowledge and practices of women regarding food adulteration[11]. According to them, people low socioeconomic group needs to be educated on the selection of right kind of food item within their low purchasing power to protect against food adulteration. They observed during a pretest that only half of the subjects were aware of adulteration. They concluded that education sessions on adulteration can help women or community at large to protect themselves against the menace of food adulteration. Mehryar and Esmaili discussed honey adulteration detection[12]. Honey composition mainly depends on its floral source. They described techniques like Chromatography (GC) and Liquid

Chromatography (LC) analysis, Near Infrared Transflectance (NIR) spectroscopy, Fourier Transform Infrared (FTIR) spectroscopy with Attenuated Total Reflectance (ATR), Protein characterization, High - Performance Anion-Exchange Chromatography with Pulsed Amperometric Detection (HPAEC-PAD), Liquid Chromatography Coupled to Isotope Ratio Mass Spectrometry (HPLCIRMS), Calorimetric methods (Application of DSC), Stable Carbon Isotope Ratio Analysis (SCIRA), Fourier Transform (FT), Raman spectroscopy and Microscopic detection. Their study provided useful information about each aspect of honey authenticity. Johnson discussed Food fraud for economical benefit[13]. According to him, most high-profile case is adulteration of milk and its other products. The addition of melamine is commonly observed in these cases. Food product like honey, meat and grain-based foods, fruit juices, organic foods, coffee, and some highly processed foods are often prone to adulteration.

Conclusion

Food adulteration is very increasing and dangerous phenomenon. It is being practiced from ancient times. Adulteration for maximizing profit is very commonly practiced unethical practice. There is need for increasing moral and ethical values. There is need for people friendly methods for analyzing or at least identification of adulterations. Also use of branded items can minimize harms due to adulteration. The need for cheap products is also driving factors for adulteration in developing and underdeveloped countries. Poor people opts for low cost products rather than quality product as they cannot afford high price items. Economic and educational empowerment with strong education system can create awareness and minimize harm due to adulteration.



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