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SURVEY OF FRAUD IN THE FOODS THAT WERE USED IN ITS PRODUCTION OF SAFFRON

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ABSTRACT

Food fraud is referred to as the intentional substitution addition tampering or misrepresentation of food. Food fraud is a broader term than the economically motivated adulteration. Different method are performed of fraud for instances include carcinogen colorants in foods, melamine in milk, species swapping of seafood, dilution of fruit juices, unauthorized repackaging**.**Although the vast majority of food fraud incidents do not pose a public health risk, some cases have resulted in actual or potential public health risks such as continuous consumption a substance that can be used as the artificial colors.It is not known conclusively how widespread food fraud is in Iran or worldwide therefore this deficit gave us the motivation for our review.In the total of 203 food samples tested in 72 (35.46) samples were detected food fraud therefore this survey showed that economically motivated food fraud and adulteration was an emerging and serious food safety problem in Iran.The results of the survey can be used not only to analyze food safety risks but also to prioritize target areas for food policy-making and enforcement of food safety regulation.

1.Introduction

1.1. Saffron

Saffron, the dark-red and dried stigma of Crocus sativus L,. very valuable for its Special aroma, color, taste and medicinal properties, belongs to the Iridaceae family and is native to Europe, Asia, and the Middle East such as Iran. At the moment considered the world's most expensive spice (Baghalian *et al*., **2010**; Fernández and Pandalai *et al*., **2004**). Nowadays, saffron are used almost in all cases for cooking purposes to give color and flavor to food products. With regards to the total amount of saffron production**,** Iran is the biggest producer country in the world, After the Iran located countries Greece, Morocco, India, Spain and Italy (Maggi *et al*., **2003**). Saffron has also been cultivated in Turkey, Azerbaijan, and China. But the saffron mine is Iran because now more than 90% of the total saffron produced in the world is produced in Iran (Ghorbani *et al*., **2008**).

The constituents of saffron that are considered pharmacologically active and main contains volatile agents (e.g,. safranal), bitter principles (e.g., picrocrocin), picrocrocin is the glycoside precursor of safranal (2,6,6-trimethyl-**1**,3-cyclohexadiene-**1**-

carboxaldehyde), that is in turn the most abundant of the volatile compounds responsible for the aroma of this spice and dye materials (e.g,. crocetin and its glycoside, crocin), crocins are crocetin esters with glucose, gentiobiose, neapolitanose or triglucose sugar moieties. These water-soluble carotenoids are responsible for saffron's yellowish color (Maggi *et al*., 2003; Anastasaki *et al*., 2010; Rios *et al*., 1996).

Saffron has shown antidepressant effects in several surveys (Schmidt *et al*., 2007; Abdullaev Espinosa-Aguirre *et al*., 2004; Hausenblas *et al*., 2015; Hausenblas *et al*., **2013**) and also anticonvulsant properties (Hosseinzadeh and Khosravan **2002**), anti-inflammatory properties, antinociceptive and (Hosseinzadeh and Younesi 2002) the anticancer properties (Zheng *et al*., **2011**; Bhandari **2015**) also proved. Another studies such as Hajime Fukui and et al reported that saffron odor may be effective in treating menstrual distress (Fukui *et al*., **2011**) and study of Soheila Pirdadeh Beiranvand and et al proved daily usage of Saffron is reduced of menstrual pain (Beiranvand *et al*., **2015**). In other study antioxidant activity (Serrano-Díaz *et al*., **2012**; Sánchez-Vioque *et al*., **2012**), antityrosinase (Li *et al*., **2004**), arterial pressure reducer (Fatehi *et al*., **2003**) of the saffron plant cited. In study of Concepción Pintado and et al (2011) mentioned compounds and probably their chemical relatives, are involved in the antibacterial activity of saffron, and that this effect can significantly reduce the risk of food contamination with Salmonella by this spice (Pintado *et al*., **2011**).

1.2.Food fraud

Food fraud is referred to as the intentional substitution addition tampering or misrepresentation of food. Food ingredients or food packaging for economic gain to the seller. Food fraud is a broader term than the economically motivated adulteration or EMA (Nenadis and Tsimidou **2016**; Wilson **2008**; Foster **2011**).

Examples of Food Fraud include:

- Horsemeat in ground beef
- Peanut Corporation selling known contaminated product
- Diluted or extra virgin olive oil
- Melamine in pet food and infant formula
- Over-icing with unsanitary water
- Unauthorized unsanitary repackaging (up-labeling or origin-laundering)
- Cargo Theft reintroduced into commerce (Spink *et al*., **2015**).

1.3.Food color

Throughout human history, food color has been a main feature of sensory quality assessment. With the emergence of processed food, food coloring has gained even more importance. According to consumer's belief, food coloring should be as natural as possible; however, there is actually no standard regarding the naturalness of food coloring. In addition to, word natural not surely mean edible. There are different methods for food coloring, include the addition of intensely colored food to coloration by synthetic dyes which means artificial colors. Using coloring food offers the most natural way to color food with food (Johnson **2014**). Legislation on the coloring and subsequent labeling of food is exist in Iran.

Many synthetic dyes have been banned because of their adverse effects on laboratory animals. Especially colors that as the fraud are used instead of saffron. It is of concern that Yellow **6** may be contaminated with significant levels of recognized carcinogens. Also, while rarely life-threatening, Yellow 6 causes mild to severe hypersensitivity reactions in a small percentage of the population and may cause hyperactivity in some children. Even if it does not cause cancer, Yellow 6 raises other, lesser concerns. Because it provides no health benefit whatsoever, Yellow 6 should be removed from the food supply (Kobylewski and Jacobson **2010**).

Considering that saffron is the most expensive aromatic compounds and food additives and also has lots of benefits caused

that many fraud to replace cheap materials used instead of saffron.

2.Materials and methods

2.1. Food sampling

Food samples collected include kebabs, rice and sweets that are used in the production of them saffron. The manufacture of sweets and restaurant centers of Qazvin province had a total includes 203 the center of preparation of food were sampled over one year. The samples were collected including 68 kebab, 93 rice and 42 sweets.

2.2. Analysis method

Fraud detection took place based on Iran National Standard 259-2 (IR-ISO NO 259-2).

2.3. Thin layer chromatography (TLC)

TLC is the easiest, economical and the most appropriate chromatographic technique for qualitative analysis of mixtures of analytes because of the possibility of obtaining better results in relatively short span of time (Kucharska and Grabka 2010). Reviewed various sample preparation techniques and chromatographic conditions for the analysis of food dyes in different food matrices by TLC (De Andrade *et al*., 2014).

3. Results and discussions

The tests results have are shown in under tables.

Table 1. Food fraud observed in the restaurants

Food	Color		Total	Percent food fraud
	Natural	Artificial		
kebab	37	31	68	45.58
rice	61	32	93	34.40

Table 2. Food fraud observed in manufacture of sweets

Food	Color		Total	Percent food fraud
	Natural	Artificial		
sweets	33	9	42	21.42

Table 3. Food fraud observed in the total food sampled

Total food fraud	Color		Total	Percent food fraud
	Natural	Artificial		
	96	72	203	35.46

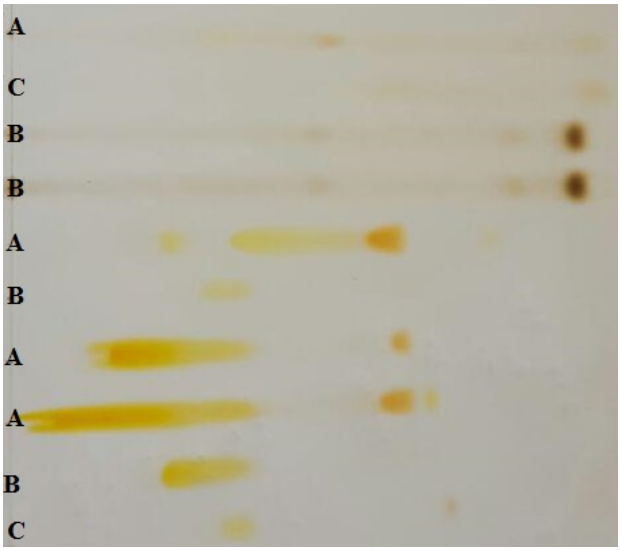

Figure 1. TLC paper: rice (A), kebab (B) and sweets (C)

Table 4. Artificial color observed in Samples of kebab

Color	Frequency	Percent
Tartrazine	15	48.38
Sunset Yellow	6	19.35
Tartrazine+ Sunset Yellow	10	32.25
Quinoline	0	0

Table 5. Artificial color observed in Samples of rice

Color	Frequency	Percent
Tartrazine	12	37.50
Sunset Yellow	8	25
Tartrazine+ Sunset Yellow	9	28.12
Quinoline	3	9.37

Table 6. Artificial color observed in Samples of sweets

Color	Frequency	Percent
Tartrazine	6	66.66
Sunset Yellow	0	0
Tartrazine+ Sunset Yellow	0	0
Quinoline	3	33.33

With human lack of awareness and carelessness, microbiological, chemical and physical hazards can by accidentally enter our foods and causing foodborne illnesses and deaths. While Casual food contamination of these hazards has always been a subject of food safety, a growing worry is in the introduction of hazards by deliberate human actions known as food fraud or economically motivated adulteration (FF/EMA) (Tähkäpää *et al*., 2014; Everstine *et al*., 2013). Recent sobering examples of FF/EMA that have drawn great attentions around the world include the 2008 incident of intentional tampering of infant milk formula with melamine in China and the 2013 horsemeat substitution scandal in Europe (Qiao *et al*., 2012; Bouzembrak and Marvin 2016). Therefore searching, communicating and managing risks from FF/EMA have become important tasks for food regulators and examiners in the interests of consumer protection and food safety (Zhang and Xue 2016) and also fraud detection in foods by reading the label on it is not possible (Charlebois *et al*., 2016).

Our survey showed 68 samples Kebab tested there was fraud in 31 (45.58%) samples and in 93 rice samples tested there was fraud in 32 (34.40%) samples and in 42 sweet samples tested there was fraud in 9 (21.42%) samples and In the total of **203** food samples tested in **72** (**35**.46) samples were detected food fraud. Other studies have confirmed the presence of fraud in foods like ours study. In study of Nunes and et al (2016) fraud consisted of injecting solutions of non-meat ingredients (NaCl, phosphates, carrageenan and maltodextrin) in bovine meat, aiming to increase its water holding capacity (Nunes *et al*., 2016).

In the study of Ghovvati and et al (2015) showed that none of the samples were contaminated with porcine residuals, but 40% of sausages samples and 30% of cold cut samples were contaminated with poultry residuals. Also the ground meat samples were not contaminated with poultry residuals (Ghovvati *et al*., 2009).

And also in study of Gheisari and et al (2008) showed 31.25% of whole samples of honey was tested is in a way of spurious (Gheisari1 and Hamidian Shirazi 2008).

4. Conclusions

Food fraud has always existed and still exists so the only way to control this issue is not careful supervision by government. The most appropriate strategy is to alert the conscience of the people who are involved in food production that in this case warning about the effects of food fraud is an efficient way because the many forgers are not aware about of the consequences of their work.

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