

## Surveillance on Artificial Colors in Different Confectionary Products by Chromatography in Qom

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Article information	Abstract
<p>Article history: Received: 24 Apr 2010 Accepted: 14 Aug 2010 Available online: 30 Oct 2012 ZJRMS 2013; 15(3): 62-64</p> <p>Keywords: Artificial colors Confectionary products Chromatography</p> <p>*Corresponding author at: Department of Toxicology, School of Health, Qom University of Medical Sciences, Qom, Iran. E-mail: arast@muq.ac.ir</p>	<p><b>Background:</b> Food color additives, which are used to give a good look to foodstuff, are very effective in the consumers' satisfaction but they can leave toxic effects on body. With respect to their extensive application, the present research aims to examine the condition of the colorings consumed in confectionary products of the city of Qom.</p> <p><b>Materials and Methods:</b> 398 items of confectionary products were sampled randomly and their types of colorings were analyzed through the Thin-Layer Chromatography (TLC) method.</p> <p><b>Results:</b> Fifty-two percent of the samples were free from coloring, 26.7 percent had illegal artificial coloring, and 21.3 contained approved artificial coloring. It was reported that yellow coloring was most consumed.</p> <p><b>Conclusion:</b> The scientific introduction and replacement of the natural colorings to the public and emphasis on their advantages play a crucial role in the health of society and can increase enthusiasm of producers and consumers.</p>

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### Introduction

The foods we eat everyday include different compounds, some of which are natural and some are added intentionally. Today, about 2,500 types of food additives are used. Using food additives with this extensive range have been questioned by a large number of toxicologists, while the effects caused by long time consumption of such compounds are often unknown [1].

In 1978, the Committee on Food Additives and Contaminants divided the coloring substances into two groups of with approval and exempt from approval. A report issued by the Joint Committee of Food and Agriculture Organization (FAO) and World Health Organization (WHO) in 1978 states that natural colorings are used without relying on the toxicological research [2].

The colors can create effects similar to asthma, hives, hyperactivity in children, suppression of the immunity system, anaphylactic reactions, idiosyncrasy and even carcinogenic effects. Therefore, appropriate application of these compounds in food industries plays an important role in the health and hygiene of the consumers. With respect to the results obtained from the study of Soltan Dallal on cookies, barberry juice, and black cherry juice in Tehran which confirmed unauthorized colorings within the considerable range of these products and taking into account the special position of the city of Qom in terms of acquiring a large number of pilgrims as well as the health of pilgrims and residents, this study aims to study the condition of the consumed colorings in 2009.

### Materials and Methods

This cross-sectional study is conducted descriptively on 398 samples including different types of cookies and confections, cream and pastry dough, coconut powder, candy and boiled sweets, different kinds of Noghli, Gaz, Sohan, Zoolbia and Bamieh. The samples were collected randomly from 41 production and distribution centers in Qom. Then, sampling was performed on them. The steps of the experiment included: 1) Preparing samples to eliminate starch substances from the colored materials using ammonia alcohol, 2) Extracting coloring using concentrated ammonia, 3) Spotting on sheets of chromatography paper in which spotting standard colorings and samples was performed using capillary on sheets of chromatography paper, and 4) Preparing solvent tank. The solvent contains sodium citrate, hydrochloric acid, ammonia, and distilled water.

The solvent was poured into the rabbit of tank and the chromatography paper, which has been prepared in the earlier stage, was folded and put in the rabbit in a way the spots were placed above the solvent level. Then, the tank entry was closed and the spots were allowed to move within 1.5 hrs. Then, the paper was taken out and placed under the hood to become dry. While spotting the sample, a spot was created beside the main sample using a similar standard coloring. Then, the movement of the spot, which was made by the sample, was compared with the standard

coloring. The final report included the types and names of the used coloring [5].

## Results

After interpretation of chromatography paper by comparing the movement of the spot made by the sample and the movement made by the standard coloring and identifying the coloring, it became clear that 52 percent of the samples were free from any additive coloring, 26.7 percent contained unauthorized artificial coloring, and 21.3 percent contained authorized artificial coloring. Finally, 48 percent of the samples were reported to be non-consumable. It should be noted that the samples with both authorized and unauthorized artificial colorings are non-consumable.

The range and variety of applying artificial colorings in confectionary products included the unauthorized yellow coloring, which was the coloring used most, and then Quinoline, Sunset Yellow and Carmoisine colorings, respectively. In some cases, coloring compounds of Quinoline and Carmoisine and/or Quinoline and Brilliant Blue had been used. Among the categorization made on the products, Sohan (sweetmeat) product had the most samples in terms of containing unauthorized colorings and after that Zoolbia and Bamieh (sweet pastry) products in Ramadan were placed within this time interval due to their high consumption.

## Discussion

The results obtained from the present research indicated that approximately half of the samples are non-consumable due to application of artificial colorings. In food industries, especially in confectionary industry, due to more variation of products to attract consumers' satisfaction, many food additives are used and the major types of the additives are colorings. According to the definition, an additive substance is a substance with a technical function and special application, which is added to food deliberately in certain quantities, with a determined method, and for special purposes. The additive colorings refer to substances like dyes, pigments and other sort of the artificial substances or substances extracted from botanic and/or animal and/or mineral sources [6].

The colorings and additives which are added to foodstuff have little known advantages for consumers. However, they may be important for producers. The main reason would be creation of variety and attractiveness in food products. At present, there is little reliable information about toxicity of food additives on human [1]. Cross-reactions may occur between the additives and the substances which contaminate foodstuff naturally, such as those occur between salicylates and tartrazine [1]. Tartrazine is a common modern coloring which is orange and mainly used in drinks, such as orange juice, a wide range of foodstuff and even medic. The toxic effects which are attributed to tartrazine are hyperactivity

induction in children, creating hives, and red skin rashes [1, 3]. Other colorings used in foods including erythrosine, Sunset Yellow can also cause hives which is due to releasing histamine. Asthma may also be caused by the hyperaesthesia to tartrazine. According to a study, 11 percent of people with asthma are allergic to orange drinks. Allergy to tartrazine is sometimes attributed to aspirin intolerance. In fact, 40 people who are allergic to aspirin, show reactions of acute asthma to hives and a mild rhinitis to tartrazine.

The mechanism, which causes allergy to tartrazine is unknown. However, it does not seem that IgE antibodies or prostaglandins synthesis system involve in this issue. Colorings may cause anaphylaxis, metabolic and idiosyncrasy reactions or affect blood pressure, mitochondrial respiration, liver, kidneys, and vitamins levels [1, 3]. For instance, canthaxanthin, which is a synthetic carotenoid pigment, unlike beta-carotene, does not turn into vitamin A and is able to accumulate retina and causes retinopathy. A study carried out by Neera Mathur on the toxic effects of Methylene Blue food coloring indicated that this coloring causes sperm morphological abnormalities in adult albino mice. The effects include body weight reduction, testis weight reduction and sperm count which is completely dependent upon the dosage [7]. On the other hand, considering the study of Makioszek, genotoxicity of two common food colors, Quinoline Blue and Brilliant Black, on Human Lymphocytes cells in In-vivo environment are verifiable through two accurate and complementary techniques of micronucleus (MN) and comet assay. Another study carried out by Neera Mathur on Sunset Yellow coloring indicating that exposure of lab animals to semi-toxic dosage of Sunset Yellow causes specific changes in the whole lipid reserve of body. As lipids have a structural role in biological membranes of body, such changes in lipid reserve cause disorders in their metabolism and may create serious liver damages such as necrosis [9].

According to Delaney rule, consumption of any food additive, which causes cancer in animals and/or humans, is forbidden. This rule is used for additives, additive colorings and animal medicines. If additive substances and colorings and/or animal medicines consumed by animals and/or human cause cancer which is repeatable and not secondary in terms of nutritional and hormonal factors or physiological imbalance, then they can be consistent with this rule [4].

Business units which produce confectionary products, with respect to the absence of the technical officer in the production unit and having no license or health code, using the artificial colorings, even the authorized ones has announced to be forbidden. Such production units are only allowed to use natural and herbal colorings [3, 10]. Undoubtedly, introducing natural colorings to the public and emphasizing their advantages as well as satisfying consumers' sense of diversity can guarantee the health of society and increase producers' enthusiasm to use natural colorings. For instance, replacing artificial red coloring with barberry fruit anthocyanins in food industries is very

useful. It has anti-inflammatory effects, prevents capillary fragility, and reduces blood vessels permeability [11].

Saffron is also another coloring which is quite natural with numerous therapeutic properties. Saffron was introduced as the herbal medicine of the third millennium. According to research, in addition to the useful effects mentioned in traditional medicine, saffron's anti-cancerous effects are outstanding. By comparing these results with the results obtained from other research, it seems that yellow color is most welcomed.

Certainly, the important issue is to notify different guilds, especially confectionary guilds, about the toxic and adverse effects of unauthorized colorings. Of course, natural colorings may have toxic effects on human health in some quantities and under certain conditions. Therefore, it is not possible to express definite opinion about the absolute safety of colorings without relying on toxicology research [4]. The main reasons for the extensive applications of additive coloring among this guild include high price of costs, instability and low value

of natural coloring, and lack of knowledge of users about these colorings. Certainly, the first and foremost step would be the increase of knowledge of producers and consumers of such substances about their adverse effects via those who are in charge of the health of society.

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### Conflict of Interest

No conflict.

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