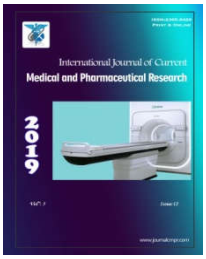
INTERNATIONAL JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH
ISSN: 2395-6429, Impact Factor: 4.656
Available Online at www.journalcmpr.com
Volume 5; Issue 12(A); December 2019; Page No. 4806-4809
DOI: http://dx.doi.org/10.24327/23956429.ijcmpr201912807



Research Article

SURVEY ON THE USE OF SYNTHETIC FOOD COLORS IN FOOD SAMPLES PROCURED FROM DIFFERENT PARTS OF KABUL CITY

Bashir Ahmad Bashir[1] and Gul Nazir Nasime[2]

[1]Faculty of Pharmacy and Chemistry Science, Kabul University
[2]Department of Nutrition and Food Analysis, Organic chemistry

ARTICLE INFO

Article History:
Received 10th September, 2019
Received in revised form 2nd October, 2019
Accepted 26th November, 2019
Published online 28th December, 2019

Key words:
Unpermitted food colors, hazardous, consumption, unbranded food items anxiety.

ABSTRACT

The present study was carried out to find the type of food colors added to various food products from different parts of Kabul city. Different types of unbranded food items, especially consumed by children, were analyzed for isolation and identification of the added synthetic un-permitted food colors. This research includes only imported food items. The majority of imported food items contained permitted colors but some foods especially unbranded items contained non-permitted colors. More of these products are consumed only by children. About 11.66% unbranded food items and 5% branded respectively, were found with not permitted colors for human consumption.
Incidences of the use of non-permitted food colors were higher in the case of unorganized food makers. Supervision of food colors constantly is needed to ensure customers about the safety of these foods. Also serious action and continually inquiry must have performed about control and limits of un-permitted food colors.
Moreover, consumption of colored food items should also be controlled by making the society aware of the hazardous effects of food colors.

INTRODUCTION

Long-lasting wars in Afghanistan caused domestic production has been reduced, so much packaged and unpackaged colored food items are imported from foreign countries, especially sub-standard food that is consumed by children. That is clear, children like colored foods. On the other hand, quality control of imported food items isn't reliable and reputable. So imported food products can compromise children health to serious diseases. Samples including all kinds of foods that is sweet, colored and has an attractive appearance for children.[18]

It is a known fact that if the food does not look attractive then consumers will probably reject it. So that food appeals to customers and is accepted by them, the manufacturers add color, but at the same time try to retain its natural looks, as far as possible. Natural appearance is always more appetizing than anything that looks unusually colored. In fact, most consumers believe that colors in foods are their natural colors even though many foods could contain added artificial colors.[3].[22]

Food colors are the major source of food intoxication and surveys have been conducted to determine the presence of non-permitted food colors in different food products.[14]

Most manufacturers use a variety of colors in their products. Similarly, colors are often used in the manufacturing of various kinds of foods by the big manufacturers. It has been suggested that consumption of foods containing color additives could sometimes lead to harmful effects [2].[7].[17]

Synthetic colors are reliable and economical for restoring the original shade of the foods (that would otherwise be virtually dull) compared to the natural colorants which are expensive, less stable, and possess lower tectorial power.[1][.2]

The use of synthetic colors by the food processing industry is increasing because they are considered as important adjuncts. The use of non-permitted colors is known to cause adverse effects in experimental animals and humans.15,16 Repeated exposures to even the permitted synthetic colors may be hazardous. Many of these dyes are originally derived from coal tar, commonly called coal-tar dyes, contain the azo group.[16] By definition, colored chemicals are active chemicals hence requiring greater care than bland additives such as emulsifiers.[6]

In recent years, these colors have been subjected to rigid toxicological examination with the result that most of the countries now have a very short list of permitted colors and/or additives. Different countries permit different synthetic food colors. The USA permits seven food colors, including Fast Red (which is prohibited in India), Iran and Australia permit thirteen each and in the European Union (EU) sixteen synthetic food colors are permitted. European countries have

Corresponding author:* **Bashir Ahmad Bashir
Faculty of Pharmacy and Chemistry Science, Kabul University

been harmonizing the regulations and most of the controls on colorings in food items from EU directives. Each country is attempting to review these controls by surveillance work. The maximum limit of permissible colors to be added in any food shall be 0.1 g/Kg of food as consumed. The Acceptable Daily.[9]

Intake (ADI) has been defined as the amount of a substance that can be consumed every day throughout the lifetime of an individual without any appreciable health effects. Even permissible artificial colors, if consumed indiscriminately are not safe. The ADI of erythrosine was reduced from 2.5 to 0.1 mg kg 1 body-weight, as it produced effects on thyroid function in short-term studies in rats. Keeping in view the hazards of coloring compounds, a research study was conducted to find out the percentage of unpermitted food colors.[11]

METHODS AND MATERIALS

Samples of different food items were collected from the different general market, the alley and alleyway shops. Samples were categorized as branded i.e. having some labels and trade names and unbranded having no labels either unpacked or packed by the vendors.

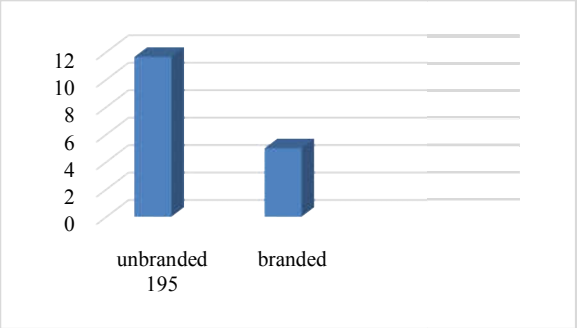


Figure 1 Survey of Colored food Items

A total of 200 samples of different food items of confectioneries, products were analyzed for their colors out of which 5 were branded and 195 were unbranded items.

The collected samples were labeled with date and lab code. The other necessary information of the samples, like area or location etc, was also recorded. Colors were extracted from all the samples and then analytical techniques were used to analyze the colors qualitatively and quantitatively.

Color Extraction

All the collected samples were tested for their colors against the available standards for food and textile colors (Table 2). Colors were extracted from different food samples by dissolving solid and semi-solid food items in water before isolation of colors.[2]

Table 2 List of Standard Food Colors

S. #	Food Color Additives
1	Erythrosine
2	Brilliant Blue FCF
3	FD&C Blue 2 powder
4	Patent Blue V powder
5	Tartrazine
6	Sunset Yellow FCF
7	Ponceau 4R
8	FD&C Green No. 3
9	Indigo carmine
10	Acid Blue 9
11	Amaranth
12	Black PN powder
13	Bluish Red
14	Brown HT powder
15	FD&C Red No. 4
16	Acid Violet 49

Identification of Extracted Colors

Food colors were analyzed at all levels of complexity, ranging from the cursory examination for confirmation of identity to the exhaustive purity determinations. Food colors were extracted from food materials including all kinds of candies, sweets products that have been identified qualitatively by UV-visible Spectrophotometer (Pharma Spec UV-1700 Series, Shimadzu Corporation) using AOAC (2000) method and Pearson's Composition & Analysis of Foods (1989).[19] The purity test of the colors was carried out by preparing a neutral solution of the dye at a concentration suitable for spectrophotometric analysis (0.001-0.01%). The solution is divided into three portions; to one portion a few crystals of ammonium acetate were added; to the second and third portions dilute hydrochloric acid and dilute sodium hydroxide was added, respectively, to make them 0.1 N. The spectrophotometric curves of these solutions were determined and compared with the corresponding standard curves under the same conditions.[13] The distinguishing features of these spectra may be significantly affected by careful adjustment of the pH of the colored solution towards acidic or alkaline, thus providing a valuable additional degree of discrimination. Tables 2 & 3 show the available standard food and textile colors, respectively, used as the standard against which the samples were tested.

Table 3 List of Textile Colors

S. #	Textile Colors
1.	TC Yellow
2.	TC Red
3.	TC Blue
4.	TC Black

RESULT AND DISCUSSION

Traditionally, colorants are used to improve the appearance of different food products and to promote appetite and selling. The research on food additives particularly relating to colorants is very important because food is one of the most fundamental needs of man to sustain life that's why it should be fresh and free from hazardous matter particularly the sub-standard food colors and/or additives which have been frequently used in food items such as much unpacked food specially used too much by children. containing prohibited colors and toxic chemicals or additives and are usually vented outside areas of the city.[6] There is no quality control in such products and the quantity of the colors and additives is generally higher to the toxic levels, even if the colors used are permissible colors or additives, compromising human health to serious diseases, resulting to an indirect financial burden over the national economy. Results of the study revealed that 5% of branded and 11.66% of unbranded food items were unfit for human consumption respectively.

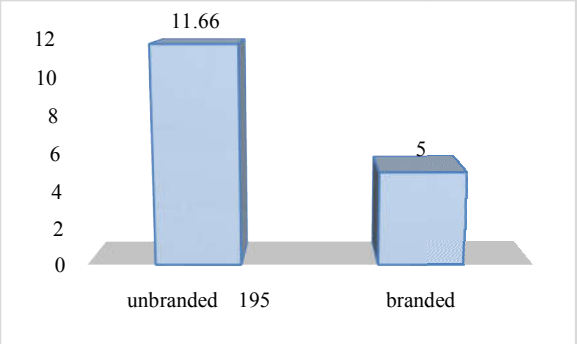


Figure 3 percentage of unpermissible food Colors in Food Items

Results show that the colors that are widely used in our food items which were found as permitted food colors were Ponceau 4R) whereas Congo Red, Metanil yellow, Orange 11 were identified as non-permitted food colors found in different low-grade and cheap food products.[22]

There is a dire need to create awareness at different levels about the toxicity of food colors both the use of non-permitted colors or excessive use of permitted food colors.[14].[15] During the 1970s, many cases of Tartrazine sensitivity were reported. Tartrazine (FD &C Yellow No.5) is an approved azo dye present in many food products; its sensitivity is most frequently manifested by urticaria and asthma, the mechanism of sensitivity is obscure and is called pseudo allergy the management of pseudo allergy consists mainly of avoidance of food products that contain tartrazine.10 It has been reviewed that azo dyes (Amaranth, Ponceau SX, Allura Red, Sunset Yellow, and Tartrazine) that are widely used can be reduced to aromatic amines by the intestinal microflora and hence causes intestinal cancer.4 In the present study, the branded food items showed satisfactory results in which only 11.66% of the unbranded food samples and 5% of brandedcolors were unfit for human consumption. There are pieces of evidence which show that the overconsumption of these dyes leads to health hazards. A report on carcinogenesis. stated that the metabolism of azo dyes derived from benzidine converted to aromatic amines by intestinal bacteria is potentially carcinogenic. Azo dyes (methyl orange, methyl red, methyl yellow, Ponceau 4R, Ponceau SX, red 2G, sunset yellow, tartrazine, acid yellow, and amaranth) are widely used in the textile industry, printing, cosmetics, drugs, and food industries. Since intestinal cancer is more common in highly industrialized countries a possible connection may exist between the increase in the number of cancer and the use of azo dyes.[12]

Table 4 (FDA) Color Additives Certifiable For Food Use

S.#	Color Additive	Common Name
1	FD&C Blue No.1	Brilliant Blue FCF
2	FD&C Blue No.2	Indigotine
3	FD&C Green No.3	Fast Green FCF
4	FD&C Red No.40	Allura Red AC
5	FD&C Red No.3	Erythrosine
6	FD&C Yellow No.5	Tartrazine
7	FD&C Yellow No.6	Sunset Yellow

According to a report recently published in Current Sciences, some synthetic dyes like auramine, metanil yellow, lead chromate, rohdamine, sudan-3 and 4, orange-2 and malachite green pose serious health hazards being mutagenic and potentially carcinogenic.[21]Metanil yellow, the most frequently used nonpermitted food color widely used in food items, like "ladoos", causes insufficient oxygen supply to the skin and mucous membranes along with degenerative changes in the stomach, liver, kidney, abdomen, and testes and also found to cause cyanosis. Another report proves that the consumption of food color Red No. 3, that has estrogen-like growth stimulatory properties, maybe genotoxic and could be a significant risk factor in human breast cancer.[8]

It has been reported that of all the additives, dyes were the most genotoxic. Amaranth, Allura Red, New Coccine, Tartrazine, Erythrosine, Phloxine and Rose Bengal induced dose-related DNA damage in the glandular stomach, colon, and/or urinary bladder. The acceptable daily intake (ADI) levels recommended by the joint

FAO/WHO Expert Committee on Food Additives for amaranth and Allura red are 0.5 and 7 respectively because these dyes were tested and found responsible for the induction of DNA damage, mainly in the colon. Some food color additives pose a potential risk to the public health and are prohibited in food items and such color additives include FD&C Red No. 4. The use of amaranth as a food additive has not been permitted in the United States since 1976. Human carcinomas of the gastrointestinal tract have high incidence and mortality rates, and colorectal cancer incidence becomes much higher in recent years, suggesting environmental causes.[7]

Table 5 List of Certified Food Colors According To Ins-Number (International Numbering System for Ingredients) Eu System

S.#	E. Number	Common Name
1	E102	Tartrazine *
2	E104	Quinoline Yellow ***
3	E110	Sunset Yellow *
4	E122	Carmosine ***
5	E123	Amaranth **
6	E124	Ponceau 4R ***
7	E127	Erythrosine *
8	E131	Patent Blue V **
9	E132	Indigo Carmine*
10	E142	Green S *
11	E151	Black PN **
12	E107	Yellow 2G ***
13	E128	Red 2G ***
14	E133	Brilliant Blue FCF*
15	E154	Brown FK ****
16	E155	Brown HT **
17	E180	Rubine BK ***

* Permissible Food color found in FDA & EU system and P.F.R
** Permissible Food color found in both P.F.R & EU system
*** Permissible Food color found in EU system only
**** PermissibleFood color found in P.F.R only

Few samples show the presence of natural colors, which is significant from the safety point of view because natural colors are safer to use in foods as compared to synthetic colors. Currently, the use of natural colorants is limited due to their instability, low tinctorial power or price disadvantage. There is a need to change the trend towards the use of natural colorants, though it depends upon the consumer demand, as many regulatory bodies have banned the use of some of the synthetic dyes in foods. Evidence reported for Amaranth and Tartrazine induce immunosuppressive effects in an individual that cytotoxic effects of these substances were studied in human PBL by the colorimetric method in vitro cytotoxicity assays; the results showed clear immunosuppressive effects from the two substances tested. In Afghanistan, there is no awareness among the people about the health hazards of food colors. Using synthetic colors may not be a problem if certain control

measures are taken to keep and maintain proper regulation over the use and consumption of these dyes in foods and to discourage the use of non-edible (artificial/textile colors) in food as they are life-threatening when consumed.

CONCLUSION

The results of this study revealed that the quality of the products meant for markets is highly unsatisfactory and there is a dire need to make legislation, in this regard, at provincial and national levels, and to enforce and implement those regulations on the importers of such products to ensure the provision of good quality of food products meant for the low-income population of the country. The assessment of information related to food color additives and public awareness is lacking in our country because of the limited number of investigations as well as poor information management and exchange activities but this lack of management can be improved by compiling a database to identify the problems of food-related to color additives, quality and safety strategies. Moreover, bright and rich colored as well as unbranded food items should be avoided. Furthermore, the use of food-grade colors not only should be enforced strictly but their consumption should be controlled to get prevention from their hazardous effects. Prevention is better than cure; but, this could only be possible when every individual have some awareness about what he or she is going to take as a "FOOD" and it is the desired duty of both the parents and teachers to keep the children aware for what they are eating and what they have to eat especially during the children go out of house.

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