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RESEARCH ARTICLE

NOXIOUS ROLE OF A YELLOW FOOD DYE

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ABSTRACT

Colour is a major factor for acceptability of any food item. Now – a – days every food item available in market is dumped with synthetic food dyes. These synthetic food dyes are very harmful for our and our children health. Food dyes may have immediate effect or they may be harmful in the long run on constant exposure. Tartrazine is a popular and commonly used yellow food dye. It is a permitted synthetic food dye in India. The present review is aimed to discuss the noxious role of Tartrazine as it is used in numerous food items available in the market. Tartrazine shows a number of adverse effects on human being. The present paper recommended the limited use of Tartrazine in food items to protect our health, especially our children.

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INTRODUCTION

The colour of our food plays an important role by visually stimulating our appetite. The food industry is one of the fastest growing economic sectors in the world, generating high competitiveness among producers in search of meeting new consumer demands. For that, they try to produce attractive foods. The food colours are added to different food items in modern food industry to cater the consumers especially the children. Children consumed foods containing colour additives more frequently than adults. To make food items more attractive a number of natural and synthetic food colours are used. Synthetic food colours are more stable, cheap and easily available, so has occupied a leading position in all food additives now –a- days. Despite the benefits attributed to synthetic food colours for several years, there have also been a number of concerns regarding the potential short and long term risks of consuming these colours. All synthetic food colours are chemicals, so may induce harmful effects on regular consumption. There are eight permitted food colours in India. Their ADI (Acceptable daily intake) is also fixed by FDA (Food & Drug Administration).

Food Colour Laws and Regulations

The Food and Drug Act of 1906 in the United States established a voluntary certification program to regulate the addition of colours to our foods.

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This act banned the addition of "poisonous" colours to confectionery products and prohibited the use of colour to foods to hide inferiority. In 1938, certification of colours became mandatory. The Colour Additive Amendment was added in 1960. According to which no food or colour additive could be deemed safe or given FDA approval ,if found to cause cancer in humans or animals. Most recently, the Nutrition Labelling and Education Act of 1990 now requires that any certifiable colour additive used in food must be listed in the ingredient statement by its common or usual name. In India, FSSAI (Food safety and standard authority of India) is monitoring the regulation of addition of colouring additive to food.

Permitted food colours in India

According to the Rule 28 of Indian PFA (Preservation of food adulteration), following synthetic colours shall be used in food-

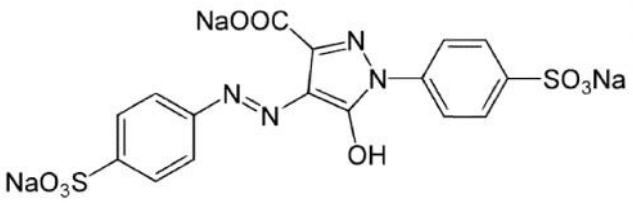
S. No.	Colour	Common name
1.	Red	Carmoisine
2.		Erythrosine
3.		Ponceau 4 R
4.	Yellow	Tartrazine
5.		Sunset Yellow
6.	Blue	Indigocarmine
7.		Brilliant Blue FCF
8.	Green	Fast Green FCF

Permitted colours are also found to have adverse effects. In the present paper noxious role of Tartrazine has been discussed,

which is one of the most commonly used permitted synthetic food dye. Studies showed that intakes of Tartrazine for children in developing countries like United Arab Emirates and India exceeded their ADIs (Husain *et al.*, 2006; Dixit *et al.*, 2010; 2011).

Tartrazine

Common name of Tartrazine is FD & C Yellow 5, Acid Yellow 23, Food Yellow 4, and Trisodium 1- 4 -5-pyrazolone-3-carboxylate. Its molecular formula is $C_{16}H_9N_4Na_3O_9S_2$. It is most commonly used artificial food dye. It is often used in beverages, skim milk, yogurt, butter/margarine, candies, gelatine, pudding, desserts, ice cream, boxed breakfast, cereals, shrimp, canned fruits and vegetables, pastas, breads, cakes and other baked goods, shampoo, cosmetics, lotions, toothpaste, vitamins supplement and different pharmaceutical products etc. The acceptable daily intake (ADI) of Tartrazine in human is 0 to 7.5 mg/kg bw (JECFA, 1996; Toledo, 1996; Hirschbruch and Torres 1998, Walton *et al.*, 1999). Tartrazine is a permitted synthetic food dye in India, but it is banned in Norway, Austria and Finland. Its Molecular structure is



Molecular structure of Tartrazine

Noxious role of Tartrazine

(i) Hyperactivity and behavirol changes

Tartrazine induced adverse effects in learning and memory functions in animals (Gao *et al.*, 2011). Tartrazine seems to cause hyperactivity in some children. Tartrazine can change behaviour in children (Schab and Trinh, 2004; McCann *et al.*, 2007). The remarkable effect of tartrazine on the behaviour of young mice has been reported by Tanaka (2006) and Tanaka *et al.* (2008). It was presumed by these studies that Tartrazine can produce adverse effect in humans also. The Food Standards Agency FSA, which is UK's equivalent to the FDA, issued a warning in 2008 about certain food colourings including tartrazine, that they can cause behavioural changes in children that included loss of concentration and impulsive, hard-to-control activity. Kamel *et al*. (2011) indicated tartrazine induced hyperactivity, anxiety and depression-like behaviours in rats and pointed out the hazardous impact of tartrazine on public health. Tartrazine hypersensitivity reactions include headaches, asthma attacks, itching or hives, insomnia etc.

(ii) Allergy

Tartrazine may cause allergies and hypersensitivity reactions, particularly in patients with asthma or aspirin intolerance. The drugs used to treat severe allergic reactions to tartrazine, such as some antihistamines and corticosteroids, may also contain tartrazine, which can further worse the symptoms (Harper, 1982). Tartrazine may cause many adverse reactions as the skin urticaria and angioedema eczema. (Lobay and Swain, 1985)

(iii) Mutagenicity and Genotoxicity

Tartrazine might also cause chromosomal damage. Tartrazine caused DNA liver and kidney damage in comet assay (Hassan, 2010). Genotoxicology studies showed that Tartrazine has possible clastogenic activity (Durnev *et al.*, 1995). It may induce DNA damage in the colon of mice by comet assay (Sasaki *et al*., 2002). Mpountoukas *et al.* (2010) showed that Tartrazine has a toxic potential to human lymphocytes *in vitro* and it seems that they bind directly to DNA.

Giri *et al*. (1990) noticed sister chromatid exchanges (SCEs) and chromosomal aberrations induced by curcumin (a natural dye) and tartrazine (a synthetic dye) on bone marrow cells of mice and rats following acute and chronic exposure via the diet. Cytotoxicity of food dyes sunset yellow (E-110), bordeaux red (E-123), and tatrazine yellow (E-102) on *Allium cepa* L. root meristematic cells was done by Gomes *et al.* (2013). The results showed that the three dyes used under the evaluated doses and exposure times were cytotoxic to the cells of the system-test used. According to Swaroop *et al*. (2011) food colours including Tartrazine can induce genotoxicity in humans even at the permissible limit.

(iv) Other risk

Mehedi *et al.* (2013) concluded that at doses of 1 and 2.5% in drinking water, tartrazine induces weight depression and adverse effects on brain, liver and kidney. Tartrazine has been linked to several other health problems, including blurred vision, migraines, fatigue and anxiety. Helel *et al*. (2000) and Himri *et al.* (2011) observed a significant increase in serum Creatinine concentration in rats after consumption of tartrazine for few days. According to Amin *et al.* (2010) high dose of Tartrazine caused a significant increase in serum total protein and serum albumin concentration in rats . Daily intake of yellow dye tartrazine, at the acceptable dose, significantly increased the number of eosinophils and lymphocytes in wistar rats. (Moutinho *et al.*, 2007)

Conclusion

The above discussion warned the health hazards of tartrazine on human being. We should not take risk with our health and the health of our children if we don't need to. The present paper recommended the limited use of tartrazine in food items to protect our health. Continuous check must be there by regulatory bodies for illegal and indiscriminate use of synthetic food colours in different food items.

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