

# Rhodamine B in Cotton Candy: A Wakeup Call for Food Safety and Standards of India

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## ABSTRACT

The presence of Rhodamine-B in eatables has set alarm bell ringing at the food safety and standards of our nation. Rhodamine, traditionally used in textile industry is a bright coloured dye which is potentially carcinogenic to human and animals. The issue first came into light after Tamil Nadu's food safety officer's lab tested the well-known soft confectionery- "Cotton Candy". After this finding a swift wave of actions are being taken by other states as well to check for presence of such chemicals in related confectionery items and similar bright coloured products. This article focuses on detailed uses of Rhodamine-B and its hazardous effect upon consumption by the animals, along with the government norms for the regulation of food additives. This paper also discusses some of the important related events in the course of recent history.

## INTRODUCTION

Cotton candy is a well-known sweet confection that could be found in almost every corner of world, popular by several names in India such as "Hawa

mithai" in Bihar, "Budhiya Ke Baal" as well as "Fairy floss" is a much favoured treat among kids as well as youngsters. These cotton candy attracted crowds because of its

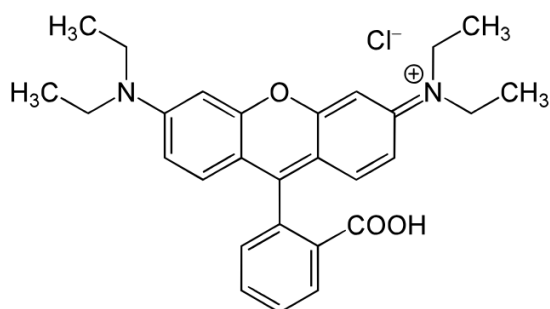
colour and soft cotton like texture in Amusement Park, circuses & melas. Cotton candy is a bright coloured non compact spun sugar confection whose main ingredient is sugar (sucrose). The traditional method of preparation of cotton candy includes the use of floss sugar (it is a dry sugar that contains flavours and dye within it), that's why cotton candy is also called as candy floss. But floss sugar is almost 10 times costlier than conventional table sugar; so, the poor sellers are compelled to use synthetic dyes [like Rhodamine B, light 550 & DY light 633] which are not meant for coloring of foods items.

### RHODAMINE-B

According to National Centre for Biotech Information (National Institute of Health)

#### Chemical structure: -

N- [9-(2-Carboxy phenyl)-6-(diethylamino)-3H-xanthen-3-Ylidene]-N-diethylazanium chloride (C<sub>28</sub>H<sub>31</sub>ClN<sub>2</sub>O<sub>3</sub>) (479.0 g/mol)



#### Physical Properties

Rhodamine-B occurs as solid at room temperature and it is in form of green crystals/red violet powder. It is soluble in water as well as alcohol and ether. Upon dissolving in water its dilute solution gives strong bluish-red fluorescent colour. This compound is highly stable as it shows resistance towards heat and biological oxidation. Like any drug it shows high plasma protein binding capability.

#### Uses

Residues of Rhodamine B are exempted from the requirement of a tolerant when used as a dye in accordance with good agricultural practice as inert (or occasionally active) Ingredients in agricultural commodities after harvest.

Due to higher stability of this dye, it is extensively used in textile industry (Sonia Mancipe *et al.*, 2021). Used as metal chelating reagent, in drugs and cosmetics. Rhodamine is an organic Chloride salt and a Xanthene dye. Used as coloring reagent in paint, leather and paper industry (Carneiro *et al.*, 2016; Saigl., 2021).

#### Effect of Consumption on Fauna

Prolonged contact with Rhodamine causes skin & eye irritation while minor consumption of this dye causes gastrointestinal irritation (Carneiro *et al.*, 2016; Saigl., 2021).

Direct consumption or exposure has not yet proved carcinogenic activity inside human but having high stability and plasma binding ability, it is believed that it may cause cancer.

According to European Environment Agency, 20% of global fresh water pollution is caused by the discharge of dyeing & finishing product by textile industry. When this RhB dye gets in fresh water it blocks the entry of sunlight into water and causes the destruction of primary producer of aquatic ecosystem. (Al-Kahtani *et al.*, 2017) Therefore, it possesses a threat to aquatic life.

Human cannot digest Rhodamine B as it is resistant to biological oxidation, so accumulation of this dye is toxic for human and may trigger liver cancer.

#### GOVERNMENT NORMS REGARDING FOOD ADDITIVES

Government of India has defined & justified food additive under chapter 3 of "Food Safety and Standards (Food Products standard &

Food Additive) Regulation (2011) as, any substance which is not normally consumed as a food by itself and not normally used as a typical ingredients of the food, whether or not it has nutritive value, should not affect the character of food viz. nutritional qualities; along with justification for the use of additive as only when its presence does not pose an appreciable health risk. Government has provided list of authorized food additive for various food category along with its INS number (International Numbering System) and maximum allowed concentration level for their additive. Out of 55 approved additives for confectionery, list of several additive for confectionary including; Hard & soft candy with their INS number & max commended level are as follows: -

- Allura Red AC (129) (200mg/kg)
- Alitame (956) (300mg/kg)
- BHA(320)(200mg/kg)
- BHT (321) (200mg/kg)
- Brilliant Blue FCF (133) (100mg/kg)
- Sunset Yellow (110) (100mg/kg)
- Neotame (961) (330mg/kg)
- Aspartame (951) (3000mg/kg)
- Sucroglycerides (474) (5000mg/kg)
- Fast Green FCF (143) (100mg/kg)
- Curcumin (100) (GMP)
- Carmel III-150c(50,000mg/kg)
- (Ammonia Caramel)
- Tocopherol (307a, b) (500mg/kg)
- Tetrazine (102) (100mg/kg)
- Lecithin(322(i)) (GMP)
- Annatto(160b(ii), (ii) GMP

In the manual for power & duties of food safety officers [section 4(1) (b) (ii)], it is written that upon suspicion FSO can take sample of any food or substance which they

believe is for sale or to have been sold for human consumption. So, the G.O.I has vested them with this power.

### **SIMILAR INCIDENTS OF HAZARDOUS FOOD ADDITIVES: -**

Erratic events of the negative impacts on humans or on the food chain with which humans are connected due to high exposure to hazardous chemicals in food is said to be an incident of food contamination (Thomson *et al.*, 2012). These incidents of food contamination have an adverse psychological impact upon the society in addition to the health consequences; such as: -

- Developing a sense of distrust and suspicion in the community regarding that particular food product.
  - Development of an environment of fear.
  - Decreasing utility of the product compared to its monetary value.
  - Reduction in spectrum of choice which will compel the consumer to settle for an inferior product.
- 1) In 2016, CSE study revealed the presence of Potassium bromate (colour less) and Potassium iodide (colour less) in 84% of the 38 common bread brands. Notably these additives were already banned in many countries & listed as hazardous for public health.
  - 2) Detection of Chloramphenicol in honey by the Canadian Food Inspection Agency (CFIA) which led to recalling the entire batch of honey produced.
  - 3) Incident of Lead toxicity in Maggie noodles which gathered nationwide attention during 2015 – The Central Food Laboratory of Kolkata found the presence

of 17.2 ppm of lead in the noodles while the permitted limit of lead in noodles is 2.5 ppm only. Also, there was significant concentration of MSG (Monosodium Glutamate).

- 4) Chinese Garlic was banned by FSSAI (2019) due to presence of heavy metals.
- 5) Sassafras oil banned by FSSAI (2003) due to carcinogenic property.
- 6) Ban imposed on Chinese milk (2008) by FSSAI due to presence of Melamine.

## CONCLUSION

There is a need to revise the “Food Safety & Standards (Food Products Standards & Food Additive) Regulation (2011)” to incorporate the changing standards of food additive and regulate it with much effectiveness. All the stakeholders (consumers, producers, policy makers and law maintaining authority) should adopt an inclusive approach where each one has unique & indispensable role to prevent the addition of such harmful additives. It could be possible by some simple measures like truthfully labelling of the products, avoid addition of dyes. In case of confectionary a simple step of selling colorless cotton, candy could have avoided this whole incident.

## REFERENCES

- Sonia Mancipe, José J. Martínez, Cristian Pinzón, Hugo Rojas, Dora Solis, Ricardo Gómez, Effective photocatalytic degradation of Rhodamine B using tin semiconductors over hydrotalcite type materials under sunlight driven, *Catalysis Today*, Volume 372, 2021, Pages 191-197, ISSN 0920-5861, <https://doi.org/10.1016/j.cattod.2020.12.014>.
- J. O. Carneiro, A. P. Samantilleke, P. Parpot, F. Fernandes, M. Pastor, A. Correia, E. A. Luís, A. A. Chivanga Barros, V. Teixeira, "Visible Light Induced Enhanced Photocatalytic Degradation of Industrial Effluents (Rhodamine B) in Aqueous Media Using TiO<sub>2</sub> Nanoparticles", *Journal of Nanomaterials*, vol. 2016, Article ID: 4396175, 13 pages, 2016. <https://doi.org/10.1155/2016/4396175>;
- Saigl, Z.M., 2021. Various adsorbents for removal of rhodamine b dye: a review. *Indones J. Chem.* vol. 21 (4), 1039–1056. <https://doi.org/10.22146/ijc.62863>. Al-Kahtani, A.A., 2017. Photocatalytic degradation of Rhodamine B dye in wastewater using gelatin/CuS/PVA nanocomposites under solar light irradiation. *J. Biomater. Nano biotechnol.* vol. 08 (01), 66–82. <https://doi.org/10.4236/jbnb.2017.81005>.
- Al-Kahtani, A.A., 2017. Photocatalytic degradation of Rhodamine B dye in wastewater using gelatin/CuS/PVA nanocomposites under solar light irradiation. *J. Biomater. Nanobiotechnol.* vol. 08 (01), 66–82. <https://doi.org/10.4236/jbnb.2017.81005>.
- Thomson, Barbara, Poms, Roland; Rose, Martin (2012). “Incidents and impacts of unwanted chemicals in food and feed” *Quality Assurance and Safety of crops & feeds.* 4(2):77-92. doi: 10.1111/j.1757-837x.2012.00129.x]