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## **A brief review of effect of dyes waste on fresh water fishes**

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### **Abstract**

*Dyes are chemicals used in textile mill, food industries, paper making and cosmetic industries are known to have carcinogenic, cytotoxic, hemotoxic and neurotoxic effect. It is recognized as one of the root cause of environmental pollution. Therefore, a study was undertaken to understand the different dyes and their effect on behavioral responses of fresh water fishes. Sub-lethal concentrations of dyes in the aquatic environment affect the aquatic organism due to their long presence, slow decomposition, and accumulation in sediments, causing respiratory distress, behavioral and morphological changes in fishes. At high concentration, it causes tremendous damage to tissues and leads to death of fishes. Although dye has a wide range of biological and industrial applications, even a minute release can affect aquatic fauna and new techniques need to be developed to mitigate it.*

**Key words-** Carcinogenic, Cytotoxic, Hemotoxic, Neurotoxic, Environmental pollution, Sub-lethal dose

### **Introduction**

Environmental pollution has been considered as one of the serious problems throughout the World especially from the textile industries (Khan and Malik 2014) [1]. The

known reasons behind this are industrialization, urbanization, and other man-made activities. Textile dyes have been used for many years for coloring and printing fabrics. The effluent contains recalcitrant and other hazardous contents, not only carcinogenic and toxic to humans and other biotic organisms (Mahmoud et al. 2010; Reddy Roja et al. 2020) [2] especially the recalcitrant nature of azo dye and the various issues raised by the releasing of azo dye in aquatic systems (Sinha et al. 2019a, b; Lade et al. 2012) [3] and various disorders to human health systems (Saratale et al. 2011; Chung and Cerniglia 1992) [4] were reported already. The complex aromatic structure of textile dye resisted detergent, sunlight, and temperature a noteworthy point mentioned here. The effluent from dye-stuff industries has contaminated the soil as well as surface and underground water (Fu and Vijayaraghavan 2001) [5] and responsible for a lot of problems in an aquatic environment. The prominent uses of Azo dyes in diversified industries like textile, leather, printing, plastic, pharmaceutical, and food. The dyeing industries used water as a principal medium for the application of dyes, and discharge the wastewater, as one among the important medium for an aquatic pollutant (Sweety 2018) [6]. Different types of dyes and additives are known which make this an organic as well as inorganic pollutant source in textile effluent. The main objective is to study the impact of dye on behavioral response of fresh water fishes.

## **Background**

### **CLASSIFICATION OF DYES:**

Dyes are organic colored compounds imparting the color to substrates like hair, drugs, paints, paper, wax etc. These are colored because absorbs visible light at certain wavelength.

**Dyes are classified on the basis of –**

1. Chemical structure
2. Sources

### 3. Application method.

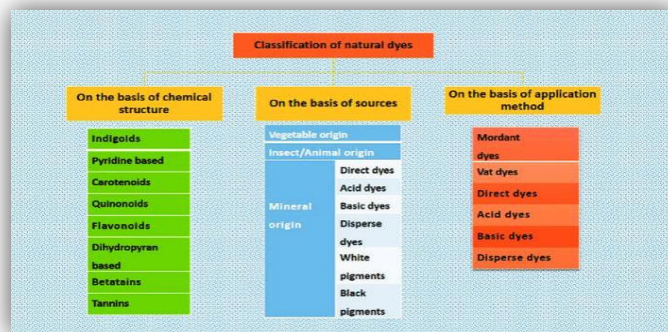


Image [14] by researchgate.net

### Toxicity of textile dyes-

The color associated with textile dyes not only causes aesthetic damage to the water bodies (Setiadi et al., 2006)[7], but also prevents the penetration of light through water (Hassan & Carr, 2018)[8], which leads to a reduction in the rate of photosynthesis (Imran et al., 2015)[9] and dissolved oxygen levels affecting the entire aquatic biota (Hassan & Carr, 2018)[10]. The textile dyes also act as toxic, mutagenic and carcinogenic agents (Aquino et al., 2014, Khatri et al., 2018)[11], persist as environmental pollutants and cross entire food chains providing biomagnification (Sandhya, 2010)[12], such that organisms at higher trophic levels show higher levels of contamination compared to their prey (Newman, 2015)[13].

### Impact on fishes

Fish have great sensitivity and response towards the changes in aquatic environment and any undesirable change might be reflected in the biochemical, physiological and histological parameters of fish. The toxicity of textile effluents poses threat to fish biota, both directly and indirectly as the direct accumulation of pollutants and the rise in physical parameters like color, turbidity, temperature and total solids makes light a limiting factor that alters food chain of fish [15]. A comparative toxicological studies of textile dye waste water (untreated and treated) on a fresh water fish, *Gambusia affinis* show a marked

reduction in mortality and cytotoxic effects on RBCs and also found reduction in their counts and percent changes in their shape (poikilocytosis) and variation in their size [16]. Another study on *Mastacembelus armatus* which is a proteinaceous edible fresh water fish exposed to textile effluents causes changes in the ionic regulations of the tissues like liver, kidney and muscle by decrease in concentration of sodium and chloride ions and an increase in concentration of potassium, calcium and magnesium ions [17]. Impact of textile industry affluent on teleost fish *Poecilia reticulata* causes abnormal behavior including erratic swimming, hyper=excitation, rapid opercular movement and thick mucus covering. Histopathological changes such as enlargement of primary gill bar and detached of secondary gill bar. Disintegration of intestinal villi and infiltration of haemocytes into the lumen was also seen [18]. Likewise, a study was also conducted on Impact of Textile- Dyeing Industry Effluent on some hematological Parameters of Freshwater Fish *Oreochromis mossambicus* [19]. The main histological changes observed in liver are hyperaemia, necrosis and degeneration [20]. There was also effect of textile dye industry effluent on the nutritive value of fresh water female crab *Spiralothelphusa hydrodroma* which is an important human food source in south India which led to loss of nutritive value such as protein, carbohydrate and lipids [21]. Likewise, in catla, dye effluent has strongly affected the rate of feeding, absorption and food conversion.

### Conclusion-

It has been reported that synthetic dyes exhibited a great group of organic compounds that would have detrimental impacts on aquatic environments . The textile industry create effluents that are very poisonous and resistant, like dyes, which have devastating effects on the environment and have been observed in freshwater fish. Plant, bacterial, extremophile, and fungal biomass can be employed to discolor, alter, or mineralize the textile dyes in order to lessen or even completely eradicate the negative effects associated.

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