



**ALTERATION IN PROTEIN AND GLUCOSE LEVEL IN THE OVARY OF  
A FRESH WATER CAT FISH HETEROPNEUSTES FOSSILIS (BLOCH)  
EXPOSED TO TEXTILE DYES**

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**ABSTRACT**

Problems of water quality with particular refer to Natural and Synthetic Chemicals have greatly intensified during recent past. The most dangerous fact of these chemicals is that, they do not decay and/or for break down readily in natural environment. Once incorporated in a food web, they pass along and accumulate in the highest member of web. Fish being at high trophic level, also gets affected through food chain. Among aquatic pollutants, dyes, pigments and effluents from textile industry are of utmost importance, which affect the life processes of aquatic organisms. The present study is undertaken to assess the toxic effects of chronic exposure to textile dyes, on protein and glucose level in female gonads of fresh water teleost *Heteropneustes fossilis*. A decline in ovarian protein and glucose indicates adverse effects of textile dyes on the reproductive physiology of fish.

**Keywords:**

*Pollutants, Textile dyes, Heteropneustes fossilis, Reproductive physiology.*

**INTRODUCTION**

With the advent of industrialization and modernization of textile industry, the developments of dyes and pigments became inevitable. Textile dye exposure causes chromosomal aberrations (Kumar *et al.* 1992) leads to mutagenicity & genotoxicity (Rastogi & Levin, 1988; Khanna & Das 1991). These chemicals produce quantitative and qualitative changes in metabolism of organisms. Body components like protein, carbohydrates and lipids play a significant role in body construction and energy production. Inhibition of metabolic activities of protein and glycogen in muscles and gonads of fish, induced by textile dyes IS also reported (Duggar and Dhurve, 1987).

**MATERIALS AND METHODS**

**A: - Materials:** Fish - *Heteropneustes fossilis* (Bloch), fresh water cat fish were chosen as the experimental animal. It has accessory respiratory organs which make it hardy and a good experimental animal.

Pollutants : The three commonly used textile dyes belonging to group of Reactive dyes were taken for experiment.

- a) Reactive Orange (HGR)
- b) Reactive Blue ((Procion Brilliant Blue)

c) Reactive Yellow (Cibaro Brilliant Yellow 3 GP)

**B: Method:** Experiments were conducted to see the effect of chronic exposure of three textile dyes on the ovarian protein and glucose levels of fish Heteropneustes fossilis. For the experiment adult and healthy female Heteropneustes fossilis of approximately same length ( $16 \pm 2$ cm) and weight ( $20.5 \pm 3$ g) were selected. Fishes were acclimatized in laboratory for 15 days before commencing the experiment. The experiments were conducted for 3 durations of time. Fishes of both experimental and control groups were scarified after an interval of 21, 35 & 49 days.

The experimental groups were exposed to safe concentrations of 3 textile dyes (Table No.1)

**Table 1:** LC<sub>50</sub> values and test concentrations of pollutants

S. No.	Name of the pollutant	LC <sub>50</sub> (96 hr.)	Test Concentration
1.	Reactive orange	190 ppm	25 ppm
2.	Reactive blue	180 ppm	20 ppm
3.	Reactive yellow	195 ppm	25 ppm

### WATER ANALYSIS

Physiochemical properties of water of control and treated groups were estimated before changing water of aquaria on every 4th day, as per methods described by APHA (1985) Water was analysed for following parameters - pH, temperature, Dissolved oxygen, Alkalinity and Hardness

### BIOCHEMICAL ESTIMATIONS

Biochemical estimations for protein and glucose were carried out in the ovaries of control and treated groups of fishes. All chemicals used were of analytical grade. The optical densities were read on photoelectric colorimeter (Erba, Tokyo model AE II S).

Protein was estimated according to the method of Lowry et. al. (1951).

### STATISTICAL ANALYSIS

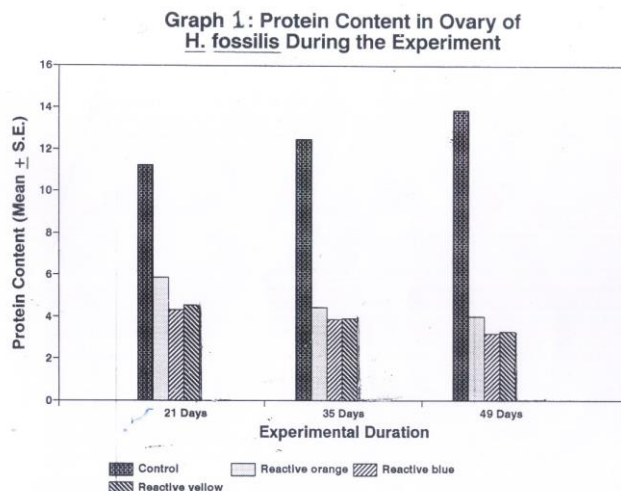
The results of Bio-chemical estimates of control and treated groups were compared by student's "t" test to see level of significance (Scheffler, 1980)

### OBSERVATIONS

#### Protein:

The changes in protein content in ovaries of control and pollutant treated fishes were estimated after 21, 35 and 49 days of exposure.

In control group a continuous increase in protein content was observed. A gradual fall in the protein content as compared to control was seen in the ovary of the experimental groups. (Table 2; Graph-1)



## DISCUSSION

### Protein:

A gradual increase in protein content in the fish ovary, during maturation phase has been reported (Sinha and Pal, 1990). Noted increase in protein content in ovary of control group was found during this investigation (Graph1).

Pollution in general, is hazardous for fish reproduction and gonadal activity. Stress induced biochemical changes are described as secondary response of fish. The biochemical contents such as protein and glucose etc. are considered as markers in the toxicity study (Abou Donia et al., 1988)

Significant fall in protein level in the ovaries of *Heteropneustes fossilis* and other fish species exposed to textile dyes is reported. (Duggar and Dhurve, 1987; Murugesan and Haniffa 1992). In the present study with textile dyes with protein and glucose were found to be depleted in female gonads, adversely affecting oogenesis.

Pollutants induced inhibition in metabolic activities of proteins and depletion of protein content in fish gonads due to textile dyes Black RBL supra and basic green 4, has been shown to occur (Duggar and Dhurve 1987). The depletion in protein content in animals including fish under chemical stress influences, conversion of tissue protein into soluble fractions, reaching blood for utilization. Decreased RNA synthesis and impairment of synthesis and metabolism of protein, cause protein depletion in chemically stressed fish (Haggi and Adhami, 1977; Somanath, 1991)

Reduction in protein content in the ovary of pollutants stressed *Heteropneustes fossilis* may be due to the protein in tissues undergoing hydrolysis and oxidation to meet the need for energy, along with suppression of protein synthesis in tissues due to the stress of pollutants, as also suggested by earlier investigators. (Somanath 1991; Jaiswal et al., 1991). In the present study with textile dyes both protein and glucose were found to be depleted in female gonads adversely affecting oogenesis. The loss of protein due to toxic action of the pollutants in the fish ovary was in the following order

Reactive Blue > Reactive Yellow > Reactive Orange

## CONCLUSION

1. All the pollutants (textile dyes) bring about changes in water quality, which adversely affect fish life.

2. Harmful effects of these pollutants are further reflected in metabolic activities of fish by way of reduction in protein and glucose levels in fish gonad. Reduction in the level of these nutrients is indicative of increased energy demand under stress and of suppressed mobilization of these nutrients from liver and muscles to ovary.

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