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The Effect of Chromium on Glycogen Content of Certain Tissues of Freshwater Fish, Channa Gachua

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The Effect of Chromium on Glycogen Content of Certain Tissues of Freshwater Fish, *Channa Gachua*

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I. INTRODUCTION

Water pollution (Kawade *et al.*, 2012) is the biggest threat of urbanization, industrialization and modern agricultural practices. It leads to variation in physical, chemical and biochemical properties of water bodies. The aquatic environment has always been subjected to different types of pollutants (Mance, 1987; Farkas *et al.*, 2000). Beaumont *et al.*, (2000) and Braunbeck (2000) reported that rapid industrialization in India has resulted into a consequential increase in the liquid wastes, which are traditionally being liberated into open land or nearby natural water, causing a number of problems to plant and animal (Ramona *et al.*, 2001). The problems of environmental pollution and its harmful effect on aquatic biota, including fish is receiving focus during the last few decades (Jagadeesan *et al.*, 2001. Zikic & Stajin, 2001). Industrial discharges containing toxic and hazardous substances, including heavy metals contribute hugely to aquatic ecosystem (Ghem *et al.*, 2001; Woodling *et al.*, 2001). Heavy metals are natural trace components of the aquatic environment, but their levels have been increased due to domestic, industrial and agricultural movements. It poses greatest threat to the health of Indian ecosystem (Rani *et al.*, 2001; Desai *et al.*, 2002; Joshi *et al.*, 2002; Saxena, 2002). Discharge of heavy metals into the aquatic environment can change both aquatic species diversity and ecosystems, due to their toxicity and incremental behavior. Aquatic organisms including fish collects metals many times higher than present in water (Madhusudan *et al.*, 2003; Surec, 2003; Olaifa *et al.*, 2004), thus causing an adverse effect on the fish metabolism (Ohe *et al.*, 2004). Studies proved that, fish subjected to metal toxicity shows that biochemical and histopathological alterations in different target tissues like gills, liver and kidney. Histopathological lesions and increase in size of

gills was reported in fishes exposed to heavy metals (Devlin, 2006; Gupta & Ashwini, 2006). Necrosis and rupture of gills of *Labeo rohita* on exposure to Copper was reported by Kalele and Dhande (2006). Effect of sub *J. Recent Trends Biosci.*, 2(1): 29-37, 2012 29 lethal concentration of zinc on histological changes and bioaccumulation of zinc in kidney of fish *Channa punctatus* (Bloch) have been studied by Gupta and Srivastava, (2006) and Loganathan *et al.*, (2006). Impact of cadmium on the biochemical constituents of *Oreochromis mossambicus* was studied by Hameed *et al.*, (2006). Athikesavan *et al.*, (2006) studied histopathological changes in the gills, liver, intestine and kidney of nickel treated freshwater fish *Hypophthalmichthys molitrix* (Valenciennes). Among heavy metals, Chromium is being used in industries like organic chemicals, electroplating, iron and steel works electrical works, etc. Chromium is an essential trace element in humans as well as in aquatic organisms. It is listed among 25 hazardous substances that pose threat to human health. Electroplating industrial effluent containing chromium is known to alter the protein, glycogen and lipid composition in fishes (Muley *et al.*, 2007).

Glycogen in the tissue is also considered to be the immediate source of energy to adapt to the environmental conditions. Several workers have reported the impact of various heavy metals on the biochemical constituents of different aquatic organisms (Kharat *et al.*, 2009). However, the research work related to the chromium effect on *Channa gachua* is scanty. Hence the present study was undertaken to evaluate the toxicity of Chromium on the glycogen levels of gills, liver, kidney and gonads (ovary and testis) of freshwater fish, *Channa gachua*, for 24, 48, 72 and 96 hrs of exposure.

II. MATERIALS AND METHODS (KAWADE ET AL., 2012)

Adult live fish, *Channa gachua* were collected from the local market and brought to laboratory. Only healthy fishes (Length: 12-15 cms, Weight: 50-56 g) were acclimatized in glass aquaria for 15 days and were fed with earthworms and water in the aquaria was replaced by fresh water at every 24 hrs. Stock solution of Sodium dichromate was prepared by dissolving appropriate amount of Na₂Cr₂O₇ as Cr salt in distilled

water. The fish *Channa gachua* were exposed to Cr (as Na₂Cr₂O₇) to know the acute toxicity at 24, 48, 72 and 96 hrs. For selection of test concentration, some pilot tests were carried out. The range of concentration was selected between 0 to 100% mortality. In order to maintain the concentration of chromium, the water in the aquaria was changed every 24 h during the exposure. The mortality rate of *Channa gachua* was recorded at 24, 48, 72 and 96 h exposure to the heavy metal. The percentage for corrected mortality was calculated using the Abbott's formula (1952).

Table 1: Glycogen content(mg) of different tissues of *Channa gachua* after 24 to 96 hrs exposures to Na₂Cr₂O₇

Organ \ Time	Gills	Liver	Kidney	Ovary	Testis
Control	5.24	7.39	5.8	4.56	4.67
24 Hrs	4.73	5.97	4.61	4.21	4.15
48 Hrs	3.99	5.63	4.49	3.93	3.98
72 Hrs	3.76	4.61	3.93	3.71	3.59
96 Hrs	3.15	3.59	3.2	3.15	3.09

III. ANALYSIS THE DATA

We have analysis the data experimented by (Kawade *et al.*, 2012). First we have analysed the data using Pearson Correlation Matrix and after that we have concluded the result involving two way anova.

Correlation matrix was prepared within the studied parameters tabulated in Table 2. The strong positive correlation-ship between the changes of Glycogen level of these parameters could be due to Chromium use.

Table 2 : Pearson Correlation Matrix

	GILLS	LIVER	KIDNEY	OVARY	TESTIS
GILLS	1.000				
LIVER	0.971	1.000			
KIDNEY	0.958	0.995	1.000		
OVARY	0.983	0.984	0.972	1.000	
TESTIS	0.974	0.998	0.990	0.992	1.000

Now we have used the statistical tool anova for further analysis.

Let us take the Hypothesis that there is no significance difference of Glycogen content in the presence of Chromium between the Organs and Times.

First we compare the variance of Organs with the variance of residual.

F = 26.00 tabulated in Table 3.

The table value of F for $\nu_1=4$ and $\nu_2=16$ at 5% level of significance is 3.006917.

The calculated value is greater than table value and we have concluded that the Glycogen content in the presence of chromium of different organs differ significantly. That is Glycogen content at different Organs in the presence of Chromium are different. That is

Glycogen content depends on Organs in the presence of Chromium. That is chromium effects different organs differently.

Now, let us compare the variance according to Times with the variance of residuals.

F = 14.12444 tabulated in Table 3.

The table value of F for $\nu_3=4$ and $\nu_2=16$ at 5% level of significance is 3.006917.

The calculated value is greater than table value and we conclude that Glycogen content in the presence of Chromium of different Organs changes according to times. That is Glycogen content in the presence of chromium depends on times.

Table 3 : Mean squares and F values

Sources of value	Sum of squares	Degrees of freedom	Mean square(variance)	F	F critical (Tabular value of F)
Between Organs	14.86118	4	3.715296	26	3.006917
Between G Level	8.073304	4	2.018326	14.12444	3.006917
Residual	2.286336	16	0.142896		
Total	25.220824	24			

IV. CONCLUSION

It is concluded that Chromium effects the Glycogen level of different organs differently and it also acts according to time.

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