Vol 4 Issue 4 Jan.2015

ISSN No : 2249-894X

Monthly Multidisciplinary Research Journal

Review Of Research Journal

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RNI MAHMUL/2011/38595 **ISSN No.2249-894X**

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Review Of Research
ISSN:-2249-894X
Impact Factor : 3.1402(UIF)
Vol. 4 | Issue. 4 | Jan. 2015
Available online at www.ror.isrj.org

BIOACCUMULATION PATTERN OF FLUORIDE IN FRESHWATER FISH, *RITA RITA*

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Abstract:-

Bioaccumulation pattern of fluoride in freshwater fish, Rita rita was evaluated in laboratory bioassay. Analysis different organs showed that the freshwater fish *Rita rita* bioaccumulate the fluoride in different organs. Fluoride bioaccumulation is positively correlated with increase in the time of exposure was noted in all tissues of test fish. The freshwater fish, Rita rita under fluoride burden indicated that the gills recorded to bioaccumulate highest concentration followed by liver and intestine.

Keywords: Bioaccumulation, fluoride , *Rita rita.*

INTRODUCTION

Fishes constitute major food link in aquatic ecosystem. They represents an important component of tropic level in the food chain. They are having edible, economical, commercial and medicinal value. Fisher (1951) observed higher levels of fluoride content from the fish meal used in the manufacturing of prepared feeds. Kobayashi, (1951) studied the fluoride contents of ground water from Shippo village (Japan) and reported 1.5 to 5.5 ppm of fluoride in different wells. The natural aquatic systems may extensively be contaminated with heavy metals released form domestic, industrial and other man-made activities (Velez and Montoro, 1998; Conacher, *et al*., 1993). Heavy metal contamination may have devastating effects on the ecological balance of the recipient environment and a diversity of aquatic organisms (Farombi, et al., 2007; Vosyliene and Jankaite, 2006; Ashraj, 2005).

Human interventions are also emitting the inorganic fluoride into the environment knowingly or unknowingly and the main sources of its release are phosphate fertilizer production, aluminum smelting etc (Environment Canada, 1976). Release of inorganic fluorides into the surrounding areas which includes brick and ceramic manufacturing, steel production, coal burning factories, oil refineries, glass and enamel making, fluoride containing pesticides, waste from sewage sludge etc (Fuge, 1988; Fuge and Andrews, 1988, Government of Canada, 1993). Sigler and Neuhold (1972) reviewed the fluoride intoxication in the aquatic organism like fishes. The excess concentration of the fluoride in the environment can damage all forms of life. It has high biological activity and it tends to accumulate in the organisms, results adverse effects even if a very low levels are exposed (Groth, 1975).

Rita rita fish species is the popular and highly economic fish. The purpose of this research is to quantify the accumulation of fluoride in various organs like liver, gill and intestine.

MATERIALS AND METHODS

To study the bioaccumulation of fluoride freshwater fish, Rita rita (total length 10-12 cm, weight 20-30 g) were obtained from Bhima river, Solapur district, Maharashtra. Fishes were acclimated to the laboratory in large size glass aquarium for 15 days. External feeding was stopped before 24 hours to experimentation. The physicochemical parameters of water were analyzed by using APHA *et al*., (1998) methods. The fishes used to study bioaccumulation released in glass aquarium containing 7.5 mg/l sodium fluoride. After 10, 20 and 30 days of

exposure fishes were dissected to obtain their different organs like liver, intestine, gill. Dissected organs are dried in oven at 50-60 □C and make the powder with mortar and pestle. The powdered samples are used to estimate amount of fluoride by using SPANDS method.

RESULTS

Bioaccumulation of sodium fluoride in different organs of freshwater fish, Rita rita

Table – 1

Tissue	Exposure time in days	Bioaccumulation of sodium fluoride in ppm ($1/10^{th}$ of LC_{50})
Liver	10	0.33 ± 0.10
	20	0.43 ± 0.28
	30	0.74 ± 0.15
Gill	10	0.46 ± 0.17
	20	0.62 ± 0.29
	30	0.89 ± 0.33
Intestine	10	0.13 ± 0.39
	20	0.33 ± 0.34
	30	0.48 ± 0.19

Liver

After 10 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in liver was 0.33 ± 0.10 ppm. After 20 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in liver was 0.43 ± 0.28 ppm. After 30 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in liver was 0.74 ± 0.15 ppm.

Gills

After 10 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in gills was 0.46 ± 0.17 ppm. After 20 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in gills was 0.62 ± 0.29 ppm. After 30 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in gills was 0.89 ± 0.33 ppm.

Intestine

After 10 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in intestine was 0.13 ± 0.39 ppm. After 20 days of treatment of chronic exposure to $1/10^{th}$ of LC_{50} , the accumulation of sodium fluoride content in intestine was 0.33 ± 0.34 ppm. After 30 days of treatment of chronic exposure to $1/10^{th}$ of LC^{50} , the accumulation of sodium fluoride content in intestine was 0.48 ± 0.19 ppm.

DISCUSSION

In the present investigation bioaccumulation of fluoride contents was observed from different body parts like liver, gill,and intestine sodium fluoride toxicity in chronic exposure (30 days) from freshwater fish, *Rita rita*. It was observed that gill and liver was found to be more affected due to fluoride toxicity, where in these two organs fluoride content mobilized the more during the experimentation.

Bhilave *et al*., (2004) studied bioaccumulation of cadmium and lead from different organs of fishes, *Cirhinnus mrigala* and *Cyprinus carpio* after acute exposure. They have noticed that liver was found to more accumulating the lead as compare to cadmium. Thererfore, liver was found to more sensitive in bioaccumulation of both the metals. Mason *et al.*, (2000) observed concentrations of heavy metals is more in detoxifying organ. Auundsen *et al.*, (1977) observe that heavy metal concentration was lowest in muscle and highest in liver and gills. Kendrick *et al.,* (1992) observed high levels of zinc in liver and was ascribed to the binding of this metals to metallothionine. Therefore the liver is known to synthesize metal chelating proteins for storage and detoxification of these components (Webb, 1975). Rac *et al*., (2005) studied bioaccumulation of toxic sodium fluoride in soft tissues

of snail, *Helix aspersa maxima.*

From our study it can be concluded that gills is the target and first organ to be exposed to sodium fluoride because of which it accumulate more quantity of sodium fluoride. Freshwater fish, *Rita rita* as a representative fish species from inland water can be useful bioindicator organism of sodium fluoride contaminated water.

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