



ACUTE TOXICITY OF FLUORIDE TO THE FRESH WATER TELEOST *HETEROPNEUSTES FOSSILIS*

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ABSTRACT

The Impact of fluoride on aquatic flora and fauna is increasing day by day, as in the case of fish their population is getting reduced gradually. Fish population and their production have been much affected in term of both quantity and quality. In aquatic habitats fish are the most sensitive organism and get affected even upon a mild change in the surroundings. Static bioassay were performed for evaluation of short term (96 hours) acute toxicity of fluoride to fresh water teleost *Heteropneustes fossilis* visible sign of poisoning were expressed as frequent jumping, erratic movement followed by convulsions. Rapid rate of operculum movement accompanied by occasional gulping of air also recorded. Sensitivity factor showed that *Heteropneustes fossilis* is very sensitive to fluoride.

KEYWORDS : Fluoride – toxicity – teleost – acclimatized.

Introduction:

Fluoride are present everywhere in earth crust and are distributed throughout the environment. The menaces of high fluoride concentrations in surface has been recorded by various workers (Wright and Davison, 1975; Gikunjuu, 1992; Dwivedi et. At., 1975; Chand, 2001; Madhavan and Subramanian, 2001). India is one of the largest fish producing countries and ranks ninth among all nations. Analysis of water and nutritional studies have indicated that fish accumulated the fluoride to a considerable extent (Thompson and Taylor, 1933; Yamamura, et. Al., 1962; Kletsch and Richards, 1970; Zipkin, 1970; Largent, 1961; Hodge and Smith 1965). For optional dental health the world health organization recommended a level of fluoride from 0.5 to 1.00 mg/L depending on climate. As of 2015 the United State health and human service department recommend a maximum of 0.7 mg of fluoride per lit. of water. Fluoride accumulates in the bone tissue of fish and in the exoskeleton of aquatic invertebrates early stages are not clinically obvious and may be misdiagnosed as (sero negative) rheumatoid arthritis or spondylitis (Gupta et.al 2007). The mechanism of fluoride toxicity in aquatic organism is believed to involve the action of fluoride ions as enzymatic poisons. In soft water with low ionic content invertebrates and fishes may suffers adverse effects are less in hard water and sea water as the bioavailability of fluoride ion is reduced with increasing water hardness (Camargo et.al. 2003). Sea water contents fluoride at a concentration of 1.3 mg/lit. (Joseph et.al. 2015).

Material & Methods

Adults fresh water teleost *Heteropneustes fossilis* (length 10.21 ± 0.85cm, weight 37+ 42 gm.) were collected local resources and than treated with 2% KMNO₄ solution for five minutes. Prior to their use in the toxicity test, the fish were acclimatized for 15 days in 50 lit. glass aquarium under standard laboratory condition and fed them on boiled egg albumen on every alternate day avoid starvation of LC₅₀ values of Sodium fluoride, the 96 hours static acute toxicity test were conducted (APHA, 1998) Sodium fluoride (excela R) from Qualigens fine chemicals, Mumbai India procured from market and a 2% solution was prepared. Fish kept in glass aquarium in 20 lit. capacity were exposed to different concentration 5 mg, 10 mg, 15 mg, 20 mg/lit. (as fluoride) for 96 hours and LC50 was calculated by the method of Trimmed spearman_karber (Hamilton et.al 1977). The fish were not fed before 24 hours and during acute toxicity tests. Precaution were taken to remove the dead fish and food particles from the aquaria immediately.

The physiochemical properties of the tap water used in the experiment as temperature 22-25°C, pH 6.9-7.2, dissolved oxygen content 6.2 mg/lit. and alkalinity as CaCO₃ 95-100 mg/lit.

Result & Discussion

In the present investigation attention was paid towards the determination of acute toxicity of sodium fluoride to fresh water fish and probable cause of their death the LC50 values and confidence limit in *Heteropneustes fossilis* to various concentration of sodium fluoride for 24,48,72 and 96 hours have been recorded. The present study provide toxicological symptoms after sodium fluoride exposure to the fresh water fish *Heteropneustes fossilis*. Visible sign of poisoning in fresh water fish were frequent jumping erratic movement followed by

convulsions, body tortion, stiffening of the trunk muscles of secretions of excess mucous from the gills and muscles. In some fish blanching of the skin were also observed. The fish appeared excited with a rapid rate of operculum movement accompanied by occasional gulping of air and ultimately lost equilibrium and died.

Table:1

LC50 Values (ppm) are given with lower and upper confidence limit for 24,48,72 and 96 hours for *Heteropneustes fossilis*, exposed to sodium fluoride.

Hours	Lc ₅₀ Values	Confidence Limit	
		Upper limit	Lower limit
24	20.00	20.80	18.98
48	20.00	20.95	19.10
72	16.50	17.25	15.92
96	14.20	14.40	13.00

This is agreement with the report of earlier investigators who recorded similar signs of pyrethroids intoxication (Glickman et. al. ; Holcombe et.al. 1982 ; Edwards et.al. 1985; Bradbury et.al. 1987) the result also show that the *Heteropneustes fossilis*.

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