Analysis of behavioural responses of *Clarias batrachus* (Linn.) to the waste water released from SAIL, IISCO Steel Plant (ISP) , Burnpur, West Bengal ,India

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***Abstract** : The fauna of aquatic ecosystem are adversely affected by the waste water released from IISCO Steel Plant (ISP), Burnpur,which is a potent toxic pollutant. The aim of present study was a to assess the acute toxicity of Burnpur ISP waste water on fingerlings of Clarias batrachus.. The fingerlings were exposed to Burnpur ISP waste water from concentration of 100ml/lit to 500ml/lit in increasing array at intervals for 24 hrs. The fishes exhibited abnormal behavioural effects like irritability, frequent surfacing etc. It is concluded that the Burnpur, ISP waste water or industrial effluent is toxic to the fingerlings of Clarias batrachus and affect their physiology and behaviour. The present paper elaborates the behavioural responses to the polluted water.*

***Key Words** : Industrial waste water, Steel plant, Behavioural effects, Clarias batrachus*

INTRODUCTION

Industry is an important part of modern civilization. But the industrial waste water is harmful for the aquatic fauna and aquatic ecosystem.

Such industrial waste water is introduced into the aquatic body by overflow in the rainy season from the effluent drain or by improper disposal of the waste water. This toxic effect on aquatic fauna may extend to the human population through food chain. The aquatic ecosystem can also be contaminated by pesticide causing acute and chronic poisoning of fish and other organisms [4]. The damage to the vital organs of fish are done by pesticides [5,6], and biochemical alterations in the exposed fishes are caused [7-9].

Clarias batrachus is highly palatable fish and preferred for culture due to its high growth rate and taste. It is a catfish and it has high protein and low fat content .

MATERIALS AND METHODS

Live fishes of *Clarias batrachus* (Teleostei Siluriformes) were collected from local ponds during the month of April. They were brought to the laboratory carefully in plastic bags to avoid any injury and disinfected by giving a bath for two minutes in 0.05% $KMnO_4$ solution. Thereafter they were transferred to a large glass aquarium of 30 liter capacity for two weeks for acclimatization to laboratory conditions. During acclimatization fishes were fed daily with 'Tokya' baby pellet, containing fish meal, wheat flour, Vit. A, C, D, E, B_1, B_2, B_6, B_{12} and minerals etc. Dead fishes, whenever located were removed immediately to avoid fouling of the water.

After two weeks of acclimatization fingerlings were starved 24 hr. prior to exposing them to different concentration of SAIL, Burnpur ISP waste water.

Fishes of similar size (15 ± 1.0 cm) were stored out and separated into six groups of two fish each. Each group was placed in a glass jar containing 4 ltrs. of water. During assay no food was administered to fishes [1].

The experiment was conducted under natural photoperiod and temperature in the month of April. The temperature of the water was 31 $\pm 2^{O}$ C and pH 7.5 ± 0.4. During the experiment the first jar contained only fresh water but the second,third, fourth, fifth, sixth jars contained increasing concentration of diluted Burnpur ISP waste water. The respective concentration of the waste water was as follows : 100 ml/lit., 200 ml/ lit., 300 ml/lit., 400 ml/lit., 500 ml/lit. The behavioural responses of the fishes were noticed at each concentration carefully. All the fishes in the six jars were observed carefully at regular intervals for 24 hrs.

RESULTS

The Labeo rohita fingerlings exhibit a number of abnormalities in their behaviour when exposed to increasing concentration of the SAIL Growth Works (SGW) Kulti waste water (Table-1).

Table-1 : Table showing the behavioural changes of experimental fishes exposed to the increasing concentration of Burnpur ISP SAIL, waste water for 24 hrs.

Concentration of waste water (ml/lit)	Behavioural changes of the fishes to the SAIL, ISP Burnpur waste water
100ml/lit	• Fishes showed frequent surfacing.
200ml/lit	• Irritability of the fishes noticed. • Mucous secretion noticed.
300ml/lit	• Mucous secretion increased.
400ml/lit	• Fishes showed abnormality in balancing. • Fishes became more or less static.
500ml/lit	• The fishes became static.

The fishes in the first jar showed normal behaviour and remain all alive after the completion of the experiment.

DISCUSSION

The fish mortality due to industrial waste water exposure depends upon its sensitivity to the pollutants and its concentration. Different concentration of waste water also showed abnormal swimming behaviour in fishes. The behavioural changes in fishes is due to change in its physiological process. The mucous secretion is shown to have direct relationship with concentration of pollutant in water [2]. Irritability and abnormal swimming are triggered by deficiency in nervous and muscular coordination which may be due to accumulation of acetylcholine in synaptic and neuromuscular junction [3]. The increased mucus secretion after the waste water exposure is probably an adaptive response to counter the irritating effect of the industrial waste water on the body surface and mucous membrane .

It is concluded that the catfishes are less sensitive to industrial waste water. Further studies on toxicity of industrial effluents on the mortality and behaviour of fish in the laboratory and field conditions are required.

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REFERENCES

a) Reish, D.L. and P.S. Oshida, 1987. Short term bioassay, In Manual of Methods in aquatic environment research part 6, FAO Fish. Tech.pap., 247:1-62.
b) Carlson, R.W. and R.A. Drummond, 1978. Fish cough response – A method for evaluating quality of treated complex effluents. Water Res., 12:1-16.
c) Rao, J.V., G.Begum, G.Pallela, P.K. Usman and R.N. Rao, 2005. Changes in behaviour and brain acetylcholinesterase activity in mosquito fish Gambusia affinis in relation to sublethal exposure of chloppfrifos. Int. J. Environ. Res. Public Health, 2(3-4) : 478-483.
d) Heger, W., S.T. Jung, S. Martin and H. Peter, 1995. Acute and prolonged toxicity to aquatic organism of new and existing chemicals and pesticides. Chemosphere, 31 : 2702-2726.
e) Omitoyin, B.O., E.K. Ajani; B.T. Adesina and C.N.F. Oxuagu, 2006. Toxicity of lindane to clarias gariepinus (Burchell, 1822). W.J. ZOOL., 1(1):57-63.
f) Velmurugan, B., M. Selvanayagam, E.I. Cengiz and E. Unlu, 2007. The effects of monocrotophos to different tissues of freshwater fish cirrhinus mrigala, Bull. Environ. Contam. Toxical., 78(6) : 450-454.
g) Singh, N.N., V.K. Das and A.K. Srivastava, 2002. Insecticide and Ionic regulation in teleosts : A review. Zool. Pol., 47(3-4) : 49-64.
h) Srivastava Ajai, K, S.K. Srivastav and A.K. Srivastav, 1997. Response of serum calcium and inorganic phosphate of freshwater catfish, Heteropneustes fossilis to chlorpyrijos. Bull. Environ. Contam. Toxicol, 58 : 915-921.
i) Mishra,D.,S.K. Srivastav and A.K. Srivastav,2004.Plasma calcium and inorganic phosphate levels of a teleost Heteropneustes fossilis exposed.to metacid-50. Malays.Appl. Biol., 33(2):19-25.