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RESEARCH PAPER

Comparative study of endosulfan-effect on anti-oxidant enzymes (CAT and GPx) of air-breathing fresh water teleosts, *Clarias batrachus* (Linn.) and *Heteropneustes fossilis* (Bloch.)

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ABSTRACT

The fish, *Clarias batrachus*(Linn.) *and Heteropneustes fossilis* (Bloch.),were evaluated after 24 hrs of treatment of Endosulfan (5 ppb), on antioxidant enzyme (catalase and glutathione peroxidase). The sub-lethal concentration, 0.06 mg/liter and 0.05 mg/liter for 21 days treatment with endosulfan (95 % purity) for *Clarias batrachus* (Linn.) *and Heteropneustes fossilis* (Bloch.). Endosulfan exposure resulted into a significant induction increases ($p<0.05$-0.002) of GPx in all tissues studied. On the other hand, catalase activity was found to be considerably decreased ($p<0.01$-0.001) in all tissues. Results unequivocally confirmed peroxidative damage-dependent modulation of antioxidant level in liver, kidney and gill. Our study proposed, measurement of antioxidant level which may provide a useful bio-markers for aquatic-pollution monitoring and indicate that the activities of certain biomarkers in *Clarias batrachus* and *Heteropneustes fossilis*, on sensitive to pesticide.

Key words: Endosulfan, Antioxidant enzymes, Fresh water teleosts, Fish

The polycyclic chlorinated hydrocarbon insecticide, Endosulfan (6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano2,4,3-benzodioxathiepin 3-oxide), is a hazardous chemical (WHO, 1984). It is increasingly being used in India because of the ban on Endrin and the decline in the use of other organochlorine pesticides. Several instances of pollution of aquatic environment with Endosulfan residues have been reported. It is also known to be as one of the foremost pesticides found in water of major river and highly toxic to fish, in study conducted by CPCB, 2000(Central Pollution Control Board of India).

Pesticides may cause oxidative stress leading to a generation of free radicals and alterations in antioxidants or free oxygen radical scavenging enzyme systems. The antioxidant defense system has been progressively more studied because of the potential value of oxyradical mediated responses to provide bio-chemical bio-markers. The anti oxidant enzyme may induced by oxidative stress. The enzyme includes catalase, glutathione peroxidase and their reactions with oxy-radicals have been studied in fish. It is shown that the antioxidant of fish may be useful biomarkers of exposure to aquatic pollutants (Ahmad *et al.,* 2000). Knowledge of the major qualitative and quantitative similarities and differences in antioxidant defense systems among different species is necessary for the development of biomarkers .

MATERIALS AND METHODS

Fish:

Sexually mature *Clarias batrachus* (Linn.), length ranging from 40± 2-4 cm, weight 36±4-6 grams, and *Heteropneusties fossilis*(Bloch.), length ranging from 20± 2-3 cm with weight 25±5-6 grams, were collected locally and kept in large sand aquaria, each containing 50 liter water. Fishes were maintained by standard fish maintenance procedure (Elesceri *et al.*, 1998). Fish were acclimated 15 day prior to experiment. They were supplied daily with commercial fish feed at a rate of 2.5 % body weight and temperature was maintained at ambient laboratory temperature (30 ± 2.0 °C), pH 7.5-7.8, oxygen 7-8 mg/liter. Total hardness -134 mg/liter as $CaCo_3$, chlorides- 48 mg/liter, alkalinity –102 mg/liter. Fishes were transferred to a fresh volume of water every 24 hrs to minimize contamination from metabolic wastes of fishes. Feeding was stopped 24 hrs prior to experimentation.

Chemicals:

Glacial Acetic acid, Bovine Serum Albumin, Folin's Reagent, Na-K-Tartarate, $K_2Cr_2O_7$, DTNB, EDTA, , Na_2CO_3, $CuSO_4$, $NaHPO_4$, Reduced Glutathione, were purchased from Sigma Chemicals, Co. USA and Merck , analytical graded reagents were prepared in double distilled water. Technical grade Endosulfan 96% pure obtained from, Parry Co. India, was used and stock