

Characterisation of cholinesterase and histopathological features of brain of *Clarias gariepinus* following exposure to cadmium

ABSTRACT

Aim: Cholinesterase (ChE) inhibition and histopathological features of brain tissues of *Clarias gariepinus* were investigated with a purpose to develop biomarkers for monitoring heavy metals.

Methodology: The effects of cadmium toxicity on were assessed by ChE inhibition and characterisation of ChE by affinity chromatography and histological variations in brain tissues were studied by H&E staining under light microscope.

Results: The purified enzyme gave 10.58 fold purification with the recovery of 12% with specific activity of 159.729 U-1 mg . The Michaelis-Menten constant (K_m) and V_{max} value obtained was 1.985 mM and 0.4479 $\mu\text{mol min}^{-1}\text{mg}^{-1}$, respectively. The enzyme showed the ability to hydrolyse acetylthiocholine iodide (ATC) at a faster rate compared to other two synthetic substrates, propionylcholine iodide (PTC) and butyrylthiocholine iodide (BTC). ChE showed highest activity at 35°C in Tris-HCl pH 7.5. The metal inhibition study also found the maximal inhibitory concentration (IC_{50}) value for cadmium to be 0.6517 mg l⁻¹. Histological study revealed decrease in the number of cells, degeneration of Purkinje cells, increased aggregation area and cells necrosis.

Interpretation: Inhibition of cholinesterase activity and degeneration of Purkinje cells observed in the present study can be used as a tool for further developing a biomarker for detecting heavy metals in the aquatic ecosystems. *C. gariepinus*

Keyword: Biomarker; Cadmium; Cholinesterase; *Clarias gariepinus*; Histopathology