Preliminary screening and comparison of heavy metal Pollution in two Malaysia class ii river using Acetylcholinesterase from monopterus albus

ABSTRACT

Development in Malaysia is in line with positive economic growth. The situations have led to the improvement of industrial and agricultural activities that produce high-quality products of a global quality, which has a significant impact on the income of the local people. However, the activity also contributed to river pollution, where the industrial and agricultural wastes were discharged to nearby water sources, whether intentionally or not. The residues containing heavy metals are of concern because their concentration can negatively affect the environment. Furthermore, their ability to be treated or remedied is very limited. Biosensor acetylcholine, AChE extracted and purified from Monopterus albus brain, acts as an alternative biosensor to rapidly detect the presence of heavy metals with a simple application. The tests were conducted at ten different location points from the upstream to the downstream of Bentong River and Terengganu River, classified as a Class II river by the Department of Environment Malaysia. Bentong River and Terengganu River showed that five and two samples from different location points were able to inhibit AChE activity by more than 10%, respectively. The three samples with the highest inhibition were selected for the secondary screening through identification and the heavy metal concentrations determination using ICP-OES. All samples showed heavy metals such as copper, nickel, lead, arsenic, silver, chromium, and zinc at different concentrations and synergistically affected AChE activity. The use of AChE as a biosensor is able to detect and characterize pollution levels in both rivers that differ in the level of local development, such as industrial activities and population density.