

**UNIVERSITI TEKNOLOGI MARA**

**EFFECTS OF MALATHION,  
DICHLORVOS AND TEMEPHOS ON  
ACETYLCHOLINESTERASE  
ACTIVITY AND GENE EXPRESSION  
IN CLIMBING PERCH, *Anabas  
testudineus***

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## ABSTRACT

Organophosphates (OPs) are the most commonly used pesticides in the world for agriculture and aquaculture. OPs can reach aquatic environment through direct applied, surface runoff from sites of application and watersheds. Although most pesticides accumulate at low concentrations in ponds and other water bodies, they create serious problems for non-target aquatic biota, especially the fishes, due to their extensive range of biological activity. Fishes are particularly sensitive to wide range of pesticides, chemicals and toxic conditions. OPs affect target organism by inhibiting acetylcholinesterase (AChE) activity. The inhibitory effect on AChE activity may interfere in vital life processes then lead to death. The objectives of this study were to determine the sub-lethal concentration from 96-h LC<sub>50</sub> values of selected OPs and to determine the changes in activity and gene expression of AChE in different tissues following exposure to malathion, dichlorvos and temephos in climbing perch, *Anabas testudineus*. The experiment were carried out under controlled laboratory conditions. The LC<sub>50</sub> values were obtained based on the Finney probit analysis method. While total protein and enzyme activity is determined by Bradford method and Ellman method correspondingly. Moreover, absolute changes in the mRNA expression of the AChE was examined by RT-qPCR. The results showed that 96-h LC<sub>50</sub> values for malathion, dichlorvos and temephos were determined as 0.25 mg/L, 2.35 mg/L and 25.0 mg/L respectively. Thus, malathion can be ranked as the most toxic OPs followed by dichlorvos and temephos based on the lethal concentration required to kill 50% of the fish population. After exposure to the treatments group of OPs for 40 days, the AChE activity in all tested groups decreased as compared to the control group in all tested organs. It showed that all the OPs inhibited the AChE. However, the exposed fish recovered their AChE activity after 20 days and the recovery was greater in liver, kidney and gill than in brain. The fast rates of AChE recovery were always associated with the high levels of accumulated ACh. Besides that, increment in the absolute changes in the mRNA expression of the AChE after exposure and recovery was manifest in most of the examined tissues. However, only dichlorvos treatment groups showed significant difference of AChE expression from the control group ( $0.393 \pm 0.052$ ) compared to all treatments group D1 ( $2.565 \pm 0.001$ ), D2 ( $4.589 \pm 0.687$ ) and D3 ( $2.997 \pm 0.294$ ). As well as from all treatment groups to recovery group ( $0.616 \pm 0.341$ ). The findings was relevant given the liver as a site of detoxification. Hence, it is concluded that the use of pesticides should be properly and strictly controlled and regulated to prevent indiscriminate use. It was verified that repeated exposure of pesticides on *A. testudineus* can lead to inhibition of AChE activity which can cause biochemical and behavioral changes.

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