Biochemical and ecophysiological effects of fenitrothion on *Chironomus riparius* (Meigen) (Diptera, Chironomidae) : Identification of experimental biomarkers

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Biochemical and ecophysiological effects of fenitrothion exposure on 4th instar larvae of *Chironomus riparius* (Meigen) (Diptera, Chironomidae) were evaluated under laboratory conditions in order to identify pertinent biomarkers. Larvae were exposed to 2, 5, 10 and 20 g/l fenitrothion. Acetylcholinesterase (AChE) and glutathion *S*-transferases (GSTs) activities showed an opposite response to fenitrothion exposure. AChE was inhibited whereas GSTs were stimulated following the intoxication. The inhibition of AChE was irreversible and positively correlated with the concentration of fenitrothion in water. Conversely, the increase of GSTs activites was reversible and not correlated with insecticide concentration. The exposure to fenitrothion lead to an increase of Cu, Zn-associated superoxide dismutases (Cu,Zn-SOD) and Mn-SOD activities and to a decrease of glutathion-peroxidase (GSH-Px) activity. An activation of catalase (Cat) was observed in the larvae exposed to high fenitrothion concentration. The response of superoxide dismutases was rapid and sensitive to low chemical concentration but, the changes in catalase, peroxidases and GSH-Px were more directly related to ecophysiological alterations.

Electron Transport System (ETS) activity increased when larvae were exposed to low concentration, conversly, it decreased for high level of exposure. A decrease of lipid and glycogen content of exposed larvae was observed. Osmotic regulation was also significantly affected in larvae exposed to high concentration of fenitrothion and this phenomenon was correlated with ecophysiological changes (alteration in pupation and emergence). Stress protein related to heat shock proteins were induced by fenitrothion treatment as well as heat shock and hypoxia treatment. Stressor-specific parameters, simultaneously with more specific biomarkers, may be included in a useful multi-level/multi-biomarkers approach of environmental monitoring.

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