

Different enzymatic activities in carp (*Cyprinus carpio* L.) as potential biomarkers of exposure to the pesticide methomyl

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This study investigated the influence of the pesticide methomyl on different enzymatic activities in carp. The fish were exposed to a sub-lethal concentration (0.34 mg L⁻¹) of methomyl for 15 days. On days 4 and 15, catalase (CAT) and glutathione-S-transferase (GST) activities were measured in the liver and gills. Acetylcholinesterase (AChE) activity in brain and muscle was also determined. Liver catalase activity slightly increased in exposed fish when compared to controls, but it was statistically significant only at the beginning of the experiment. No changes in CAT activity in the gills of exposed and control animals were observed (mean values were in the range 10.7-11.7 nmol min⁻¹ per mg of protein). Liver GST activity was slightly inhibited in the exposed animals at the beginning of the study; however, it was significantly inhibited in the gills. Brain AChE activity was diminished throughout the experiment and significantly decreased after 96 h of exposure compared to controls (0.041 vs. 0.075 nmol min⁻¹ per mg of protein; $p < 0.001$). Our findings suggest that CAT, GST, and AChE are reliable biomarkers of effect after exposure to methomyl.

Acetylcholinesterase

Carbamate

Catalase

Fish

Glutathione S-transferase

acetylcholinesterase

biological marker

carbamic acid derivative

catalase

glutathione transferase

methomyl

pyrethroid

acetylcholinesterase

biological marker

catalase

glutathione transferase

insecticide

methomyl

water pollutant

animal tissue

Article

brain

carp

controlled study

environmental change

environmental monitoring

enzyme activity

exposure

gill

high performance liquid chromatography

liver

muscle

nonhuman

animal

carp

drug effects

environmental exposure

metabolism

oxidative stress

toxicity

water pollutant

Animalia

Cyprinidae

Cyprinus carpio

Acetylcholinesterase

Animals

Biomarkers

Brain

Carps

Catalase

Environmental Exposure

Gills

Glutathione Transferase

Insecticides

Liver

Methomyl

Muscles

Oxidative Stress

Water Pollutants, Chemical