Research Article

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Effects of sub-lethal copper sulfate exposure on blood parameters and metabolic enzymes activity in Prussian carp, *Carassius auratus* from river of Shatt Al-Arab, Iraq

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Abstract

Short- and long-term exposure to sub-lethal copper-sulfate concentrations studied in freshwater fish (*Carassius auratus*). The blood parameters, such as the content of hemoglobin-Hb and the red blood cells-RBC, were examined. Alanine transaminase-ALT and aspartate aminotransferase-AST levels in the serum were also measured. The 96-hour copper sulfate median lethal concentration-LC_{50} for the fish (n= 100) was calculated using different concentrations (1–10 mg/l). Two hundred and forty fish were put in 90 l-glass aquariums (10 in each aquarium) (180 fish in the experimental treatments) and (60 fish in the control treatments). Two groups of fish were formed. The first group was subjected to different concentrations of copper-sulfate for one week: 1 mg/l (0.58 copper sulfate LC_{50}), 2 mg/l (1.15 copper sulfate LC_{50}), and 3 mg/l (1.72 copper sulfate LC_{50}). The second fish group received the same copper-sulfate concentrations but for four weeks. The treatment with zero copper-sulfate LC_{50} served as the control. Three duplicates of each treatment were achieved (A total of 340 fish were used). The results demonstrated that the content of RBC and Hb, as well as the level of the enzymes (AST and ALT), increased significantly with increasing copper-sulfate concentration in both the short- and long-term exposed fish. The current study's findings suggest that sub-lethal copper-sulfate concentrations are responsible for bloody changes and liver dysfunction in fish. The environment's copper contamination can be monitored using these parameters.

Keywords: Fish, AST, ALT, RBC, Metals.