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COMBINED EFFECT OF WATER CONDUCTIVITY AND MERCURY CONCENTRATION ON OXIDATIVE STRESS IN GRASS CARP (*CTENOPHARYNGODON IDELLA*): *IN SITU* STUDY

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Abstract

This study assessed the combined effects of mercury concentration and water conductivity on oxidative stress in grass carp (*Ctenopharyngodon idella*) under natural conditions. Oxidative stress was evaluated through malondialdehyde (MDA) levels, a marker of lipid peroxidation, in blood samples collected over six months. Mercury concentrations and conductivity varied across sites, but no significant impact on MDA levels was detected. These findings suggest that, within the tested ranges, mercury and conductivity do not impose significant oxidative pressure on grass carp. Our results contribute valuable *in situ* data for environmental monitoring and future ecotoxicological studies.

Introduction

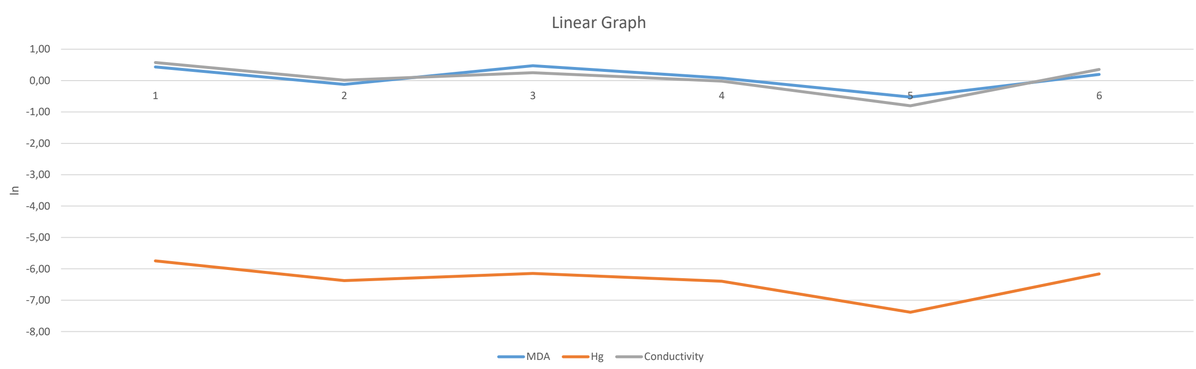
Freshwater fish are increasingly exposed to chemical pollutants and changing water quality parameters. Mercury is a toxic metal known to induce oxidative stress, while conductivity changes may reflect broader environmental shifts. Grass carp, a widely distributed freshwater species, were used to investigate how these two factors interact to influence oxidative damage. Understanding their combined effects is essential for accurate ecological risk assessment and for improving biomonitoring strategies in freshwater ecosystems.

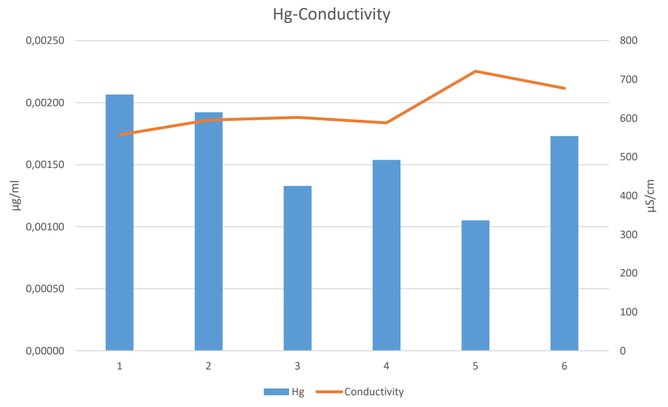
Material and method

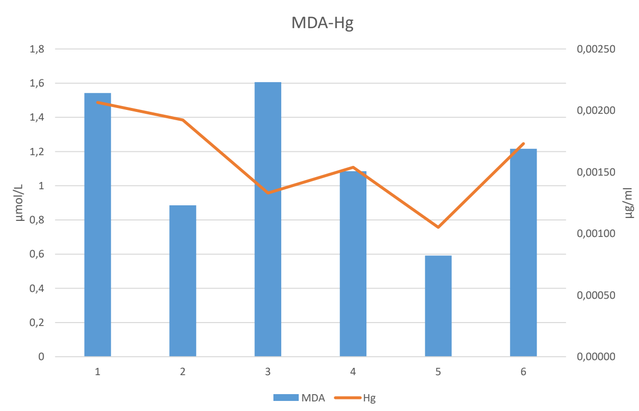
The study was conducted between April and November on 37 grass carp of mixed sexes. Blood mercury concentrations were determined using a direct mercury analyser (AMA 254). Water conductivity was measured at each site with a calibrated portable conductivity meter. Oxidative stress was assessed by spectrophotometric measurement of MDA following the thiobarbituric acid (TBA) reaction, with absorbance recorded at 532 nm. Statistical evaluation, including correlation and group comparisons, was performed using GraphPad Prism 8.1 software.

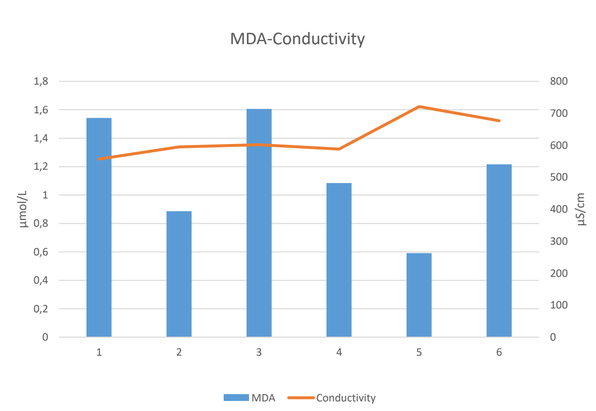
Results and discussions

Mercury concentrations in blood ranged from 0.00076 to 0.00555 µg/ml, while water conductivity varied between 557 and 726 µS/cm. MDA concentrations spanned from 0.21 to 3.11 nmol/L. No significant differences or clear trends were observed in MDA levels across the mercury or conductivity gradients. Statistical analysis revealed no strong associations, suggesting that the levels of exposure during the study period did not induce measurable oxidative stress in grass carp.









Conclusions

Our findings indicate that within the observed environmental ranges, mercury exposure combined with conductivity variations does not significantly elevate oxidative stress in grass carp. This highlights the potential resilience of *C. idella* to these stressors under natural conditions. Further research with larger sample sizes, broader exposure ranges, and different tissues could help detect more subtle or cumulative effects important for ecosystem health assessments.

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