

Submitted: 01/05/2025

Revised: 13/05/2025

Accepted: 13/05/2025

Published: 31/07/2025

Comparative study of mortalities, clinical manifestations, antioxidant-associated genes, and histopathological degeneration upon experiment infection by *Aeromonas hydrophila* in *Cyprinus carpio* and *Oreochromis niloticus*

Nadia A. H. Al- Shammari^{1*} , Khalidah S. AL-Niaeem² , Adnan B. Al-Hawash³ ,
Mosleh Mohammad Abomughaid⁴ , Aaser M. Abdelazim⁴ , Preetham Elumalai⁵ ,
El-Sayed Hemdan Eissa⁶ , Heba H. Mahboub^{7*}  and Heba Allah M. Elbaghdady⁸ 

¹Department of Natural Marine Science, College of Marine Sciences, University of Basrah, Basrah, Iraq

²Department of Fisheries and Marine Resources, College of Agriculture, University of Basrah, Basrah, Iraq

³Department of Biology, College of Education-Qurna, University of Basrah, Basra, Iraq

⁴Department of Medical Laboratory Sciences, College of Applied Medical Sciences, University of Bisha, Bisha, Saudi Arabia

⁵Department of Marine Biology, Microbiology and Biochemistry, School of Marine Sciences, Lakeside Campus, Cochin University of Science and Technology (CUSAT), Fine Arts Avenue Cochin, Kochi, India

⁶Fish Research Centre, Faculty of Environmental Agricultural Sciences, Arish University, El-Arish, Egypt

⁷Department of Aquatic Animal Medicine, Faculty of Veterinary Medicine, Zagazig University, Zagazig, Egypt

⁸Zoology Department, Faculty of Science, Mansoura University, Mansoura, Egypt

ABSTRACT

Background: *Aeromonas hydrophila* is a pathogenic bacterial infection threatening the aquaculture industry.

Aim: The current work was performed to scrutinize the impacts of *A. hydrophila* infection on the occurrence of mortalities, altering the clinical picture of fish, antioxidants-associated gene expression, and histopathological architecture of the *Cyprinus carpio* and *Oreochromis niloticus*.

Methods: Juvenile fishes including *C. carpio*, $n = 60$, and *O. niloticus*, $n = 60$ were haphazardly alienated into the control group (uninfected) and infected group with 100 μ l of *A. hydrophila*. Mortalities and clinical signs were recorded during the experiment. Samples of liver, kidney, and spleen were collected post-infection for 7 days to monitor the expression of superoxide dismutase, glutathione peroxidase, and catalase genes, plus the assessment of histopathology.

Results: The rate of mortalities was higher in *C. carpio* compared to *O. niloticus*. Additionally, infected *O. niloticus* revealed red eyes and erythema, while *C. carpio* showed exophthalmia and severe skin ulceration with exposure to viscera. The gene expression indicators showed that *A. hydrophila* significantly declined on the 1st day and the 7th day after infection, but significantly increased ($p < 0.05$) on the 3rd day compared to their respective control groups for *C. carpio*. Meanwhile, *O. niloticus* significantly regulated gene expression ($p < 0.05$) in the control groups. The histological picture indicated that the liver is the most affected organ. Moreover, *C. carpio* exhibited more disruption in histological architecture related to *O. niloticus*.

Conclusion: Overall, *A. hydrophila* is extremely virulent and results in higher mortalities, profound clinical manifestations, down-regulation in the gene expression, and histopathological alterations in the hepato-renal and splenic tissues of *C. carpio* and *O. niloticus*. *Cyprinus carpio* was more adversely affected by the infection compared to *O. niloticus*. However, *O. niloticus* revealed higher gene expression, particularly in the spleen, and the genes were more expressed in comparison to *C. carpio*.

Keywords: Gene expression, Histopathology, *Aeromonas hydrophila*, *Cyprinus carpio*, *Oreochromis niloticus*.

Introduction

Cyprinus carpio (common carp) and *Oreochromis niloticus* (Nile tilapia) are among the most economically important aquaculture species globally,

with commercial cultivation established in over 100 countries, including natural populations in Iraqi waters. Common carp, renowned for its exceptional adaptability, has achieved a widespread distribution

*Corresponding Authors: Nadia A. H. Al- Shammari. Department of Natural Marine Science, College of Marine Sciences, University of Basrah, Basrah, Iraq. Email: hhhmb@yahoo.com and Heba H. Mahboub. Department of Aquatic Animal Medicine, Faculty of Veterinary Medicine, Zagazig University, Zagazig, Egypt. Email: hhhmb@yahoo.com

Articles published in Open Veterinary Journal are licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

