Fakulta rybářství a ochrany vod
Faculty of Fisheries and Protection of Waters

Jihočeská univerzita v Českých Budějovicích
University of South Bohemia in České Budějovice
Czech Republic

Review of USB FFPW PhD thesis

First name(s), surname, titles of the PhD student: Ali Asghar Baloch, M.Sc.	**First name(s), surname, titles of supervisor:** Veronika Piačková, MVDr. Ph.D.
Title of PhD thesis: Susceptibility of common carp strains to the disease caused by carp edema virus	

REVIEWER:

Surname: Kopp	**Institution**: Mendelova univerzita v Brně Department of Zoology, Fisheries, Hydrobiology and Apiculture
Name: Radovan	
Titles: prof. Ing. Ph.D.	**E-mail**: radovan.kopp@mendelu.cz
Please describe your professional relationship to the PhD student: None	**Please describe your field of expertise:** Water quality, fisheries, cyanobacteria

QUESTIONNAIRE

Originality, scientific importance, perspectives and impacts of results presented in the PhD thesis for basic and/or applied research

I positively evaluate the originality, scientific significance, perspectives and implications of the results presented in the dissertation for research. Fish aquaculture is threatened by major mortalities due to pathogens. Fish may be immunocompromised in intensive aquaculture due to high-density rearing conditions, which may cause stress and lead to increased disease spread. Control of viral infections in fish is problematic due to the unavailability of effective treatment options. Therefore, preventive measures are often the main means of controlling and mitigating the risk of outbreaks in aquaculture. Thus, research on the immune response in common carp to viral infections is highly beneficial.

Elaboration of the PhD thesis, objectives of the work and deliverables

The presented work has a standard structure. The first chapter summarizes the overall literature review. This is followed by chapters on cytokine studies in common carp (*Cyprinus carpio* L.) in response to important diseases and immune responses in carp strains with different susceptibility to carp edema virus disease. The final chapters contain a comprehensive discussion of the thesis topic, a Czech and English summary, a summary of publications and a biography of the author.

The aim of this study was to evaluate immune responses in carp strains with different susceptibility to the viral disease carp edema. Furthermore, to determine the pattern of immune gene expression in different strains of carp infected with CEV genogroup I and to compare them with responses against genogroup IIa.

The results of the work were published in the form of a review entitled Cytokines Studied in Carp (Cyprinus carpio L.) in Response to Important Diseases and an article Immune responses in carp strains with different susceptibility to carp edema virus disease. The PhD student is the first author of both articles. He was co-author of the article Clinical and Laboratory Parameters of Carp Edema Virus Disease : A Case Report. The doctoral student's publication activity is sufficient to defend his thesis.

OVERALL COMMENTARY ON THE PhD THESIS

Fakulta rybářství
a ochrany vod
Faculty of Fisheries
and Protection
of Waters

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice
Czech Republic

Fish have a complex immune system that allows them to respond to various diseases. Research in this area is thus very problematic. Moreover, the incidence and severity of these diseases vary greatly depending on the species of fish, environmental conditions and rearing methods. The first line of defence is innate immunity, which includes physical barriers such as skin, scales and mucus, as well as cellular and humoral responses that can rapidly recognise and respond to pathogens.
A faster and stronger response is mediated by T and B lymphocytes with immunological memory, where they can recognize and respond to specific pathogens. Part of the body's fight against the pathogen is the production of cytokines that help coordinate the immune response and ensure that the appropriate mechanisms are activated to fight the infection. This area is the focus of the PhD student's work, where he described the cytokine responses in common carp exposed to infections of various kinds. In addition to a complete review of cytokine responses, his thesis provides insights into the ways in which cytokines can be used to diagnose and combat disease in common carp.
The basis of the PhD student's own research work was to investigate the immune response of carp to CEV infection using gene expression profiling and qPCR. He found that the expression patterns of several immune-related genes were similar in all carp breeds, but some significant differences were observed in coloured koi carp infected with both CEV gene families. Taken together, these results provide fundamental insights into the immunological response of carp to infectious disease and may help in the development of effective strategies for the prevention and control of CEV disease in aquaculture.

I have two questions on this issue.
Which disease occurring in common carp farms does the PhD student consider to be the most problematic in terms of the amount of damage to fisheries?
Is it feasible to develop a preventive drug, for example in the form of medicated feed, which would increase the immune response of common carp to viral diseases and thus prevent infection?

I consider the submitted thesis to be a standard thesis and to meet the requirements for the award of the Ph.D. degree, therefore I recommend it for defence.

FINAL RECOMMENDATION

- [x] **PhD thesis can be recommended for defence**
- [ ] **PhD thesis can be recommended for defence with reservations**
- [ ] **PhD thesis cannot be recommended for defence**

Brno, 1. 7. 2023
.....
Date and place

Prof. Ing. Radovan Kopp, Ph.D.
.....
Name and signature