



**Confidential**

**Review of USB FFPW PhD Thesis**

<b>First name(s), surname, titles of the PhD student:</b> David Hlaváč, Dipl.-Ing.	<b>First name(s), surname, titles of supervisor:</b> Assoc. prof. RNDr. Zdeněk Adámek, CSc.
<b>Title of PhD thesis:</b> The effect of supplementary feeding with treated feed mixtures in carp ponds upon discharged water quality	
<b>REVIEWER:</b>	
<b>Surname:</b> Marković	<b>Institution:</b> University of Belgrade Faculty of Agriculture University of Belgrade Nemanjina 6 11080 Zemun, Serbia
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<b>Titles:</b> Prof.	
<b>Please describe your professional relationship to the PhD student:</b> External reviewer	<b>Please describe your field of expertise:</b> aquaculture, pond aquaculture, fish feeding, ecology pond ecosystems

**QUESTIONNAIRE**

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

Evaluate competitiveness of the PhD thesis in the international context and compare its level with the current state of the art in the field (extent ¼ – ½ page):

Results of the research presented in the PhD thesis represent an original contribution to the knowledge on effects of the use of differently treated feed in nutrition of carp cultured in the semi intensive system on discharged water quality. A solid approach to research and the results obtained contribute to improvement of scientific knowledge, aquaculture production practice, as well as maintenance of water quality. Besides increased used of supplemental pelleted and extruded feed, the use of cereals in carp nutrition is still absolutely dominant in most European countries, therefore the study of effects of differently treated feed mixtures has its scientific and practical importance. Decreasing carp feed conversion ratio by the use of modified cereals lead to increased level of nutrients in fish body, and thus less polluting materials in pond water. This has an effect in reducing pollution of pond water and pond water recipient, and affects both pond ecological status and economy of this type of production. Thus its sustainability and opportunity for additional increase of carp production is enabled.



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

Evaluate the overall level of elaboration of the PhD thesis (structuring of the main text, comprehensibility, logicity of the chapters and their ordering) and the originality of the selected approaches to solve the objectives; evaluate publications and whether the results described correspond to objectives of the PhD thesis (**extent ¼ – ½ page**):

The text of the thesis is properly conceived and consequently arranged in clear unity. Chapters are arranged in accordance with practice and rules of PhD thesis writing. Dissertation text is understandable and readable. Publications cited and discussed in the Introduction give clear review of similar research, literature status and introduce issues that are the subject of the dissertation. References of papers published cited in the discussion, and in the general discussion, are well chosen permitting the candidate to discuss the results and compare with other authors. Research results presented are in accordance with established dissertation goals. The results obtained contribute to scientific knowledge in pond aquaculture and pond ecology.

***OVERALL COMMENTARY ON THE PhD THESIS***

Constant increase of production of aquatic organisms in the last decades and the fact that aquaculture represents the biggest resource for sufficient food supply to the increased world population necessitate constant improvement of production technology, decrease of aquatic pollution, both in production ponds and in the recipient water. Cyprinids being the most represented freshwater fish family in aquaculture, new knowledge on their biology and production technology with reduction of aquatic pollution has great importance.

Carp is mostly cultured in the semi intensive system in which requirements in proteins are met from natural food, and requirements of energy from added feed, primarily cereals. It is of utmost importance to use the form of cereal that is the most suitable in terms of water quality preservation. As an example, if the cereal is unprocessed, its digestibility for carp is about 70%; however, this can be increased to 90% by heat treatment. Using heat treatment, starch rich grains improve carbohydrate availability, thereby increasing the digestible energy levels through increased starch gelatinization and release of oils within the grain matrix. Fish feed relies increasingly on extrusion process not only because of improved chemical characteristics, but also physical (water stability). Based on this research the first article in the thesis of the candidate was published. It was concluded that mechanical and thermal treatment of feed cereal prior to its application could also help to decrease the amount of poorly or undigested feed and potentially improve water quality and nutrient budget in carp ponds. In the second and third article of the dissertation, the research goal was to assess the potential of modified cereals in pond aquaculture, with special emphasis on decreasing the feed conversion ratio and supporting nutrient uptake by the fish. Use of modified cereals resulted in a decreased feed conversion rate and better nutrient uptake by fish, and hence a lower release of phosphorus to the surrounding and recipient water. Such supplements will be beneficial not only as a source of nutrient for fish but also indirectly as a management tool for maintaining good quality of fishpond water. Use of thermally and pressure-treated cereals may provide a framework for the sustainable management of carp ponds, resulting in improved phosphorus budget over the entire pond system. Processed cereals in fish nutrition contributes to the economy of production through direct reduction of feed conversion ratio, i.e. decreased feed consumption for the same growth rate, and also indirectly through pond water



quality preservation. This additionally enables better growth rate and thus better production economy.

The topic of the dissertation chosen by the candidate is attractive and important since cereals are predominantly used as supplemental feed in carp nutrition in the semi intensive system in Europe. The thesis is conceived adequately, with clear goals set, and carefully chosen research methodology. Data obtained at the end of the study are adequately summarized, analyzed, processed, and presented in proper form of the results. The data obtained are in accordance with the dissertation goals; with answers to dilemmas about suitable treatment method of cereals processing in carp feed. Besides the answer to the question on the best form of cereals to be used, and in order to obtain best production results with least investment in production, primarily by reduction of feed utilized, the focus of the study is on effects on the pond ecosystem, its abiotic, and biotic components. Due to this, such research becomes additionally important.

Importance of the results obtained has both scientific and practical significance. Practical significance is evident for carp producers: applying this thesis results better production results will be attained by reduction of investment in feed, and also indirectly by assuring better pond environment for carp growth and development.


Thesis chapters are properly incorporated in the whole. Results obtained are discussed partially in each of the articles published as well as in general discussion. Thesis conclusions are concise, derived from the results obtained and give clear picture why are modified cereals the best choice from options offered through different treatments in carp supplementary feeding. References cited in the introduction and the discussion is adequately chosen and up-to-dated.

On the basis of the examination of the thesis entitled „The effect of supplementary feeding with treated feed mixtures in carp ponds upon discharged water quality” of the candidate David Hlaváč, Dipl.-Ing. and the analysis given in this text, I recommend this thesis for defense.

### **FINAL RECOMMENDATION**

- PhD Thesis can be recommended for defence  
 PhD Thesis can be recommended with reservations for defence  
 PhD Thesis can not be recommended for defence

08 June 2015, Belgrade  
Date and place

  
Zoran Marković  
Name and signature



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**Review of USB FFPW PhD Thesis**

<b>First name(s), surname, titles of the PhD student:</b> David Hlaváč, Ing.	<b>First name(s), surname, titles of supervisor:</b> doc. RNDr. Zdeněk Adámek, CSc.
<b>Title of PhD thesis:</b> The effect of supplementary feeding with treated feed mixtures in carp ponds upon discharged water quality	
<b>REVIEWER:</b>	
<b>Surname:</b> Kopp	<b>Institution:</b> Mendelova univerzita Zemědělská 1/1665 613 00 Brno
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<b>Titles:</b> doc. Ing., Ph.D.	
<b>Please describe your professional relationship to the PhD student:</b> none	<b>Please describe your field of expertise:</b> freshwater hydrobiology, water chemistry, hydrobotany

**QUESTIONNAIRE**

In text

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

Evaluate the overall level of elaboration of the PhD thesis (structuring of the main text, comprehensibility, logicity of the chapters and their ordering) and the originality of the selected approaches to solve the objectives; evaluate publications and whether the results described correspond to objectives of the PhD thesis (**extent ¼ – ½ page**):

Doctoral thesis is divided into 5 chapters. The first chapter contains a short introduction to dealt issues and three main objectives:

- A review of present knowledge about the effect of supplementary feeding in the fish-farming on the water quality.
- A balance and efficiency of nutrients (N, P) conversion in common carp rearing with supplementary feeding with cereals.
- The effect of supplementary feeding with variously treated cereals on the water quality, invertebrate's assemblage and nutrient balance.



In subsequent three chapters (Chap. 2,3,4), there are particular objectives in the form of one already published paper, one paper in press and one finished manuscript presented. In this place, I would like to acknowledge the clearly organized review of effect of fish-farming management on the discharged water quality.

In the last chapter, there is a short summarizing discussion of stated topics, English and Czech summary, the list of references and author's CV.

Overall, the thesis can be assessed as standardly divided with clearly specified and adapted objectives which are published in scientific journals.

### **OVERALL COMMENTARY ON THE PhD THESIS**

Presented doctoral thesis is elaborated carefully. It is obvious that the author has clear conception about the solution of stated issues. Due to the fact that the most of the thesis is presented in the form of already printed paper or paper in print, I restrict myself only to short assessment in this part. These chapters were already peer reviewed within the particular journals and the acceptance to press itself proves the quality of presented text.

I consider the published review named: "Effects of supplementary feeding in carp ponds on discharge water quality" as clearly and well organized, including all of the principal areas of stated issue. This paper proves that the author is skilled in the work with literature sources.

The second paper evaluates the experiment with conversion of mashed and thermally treated wheat in supplementary feeding of fish and the effect on the quality of fishpond water. In this part, I don't understand why the author was converting standard establishing of organic matters content by TOC to expression by COD<sub>Cr</sub>. Each converting based on the empirical relation brings certain misrepresentation of the results. I would consider either direct COD establishing or to present the TOC values as more suitable. I really wonder on which pattern was this conversion based. This fact is not comment in the current paper at all.

The last experimental part of the presented thesis evaluates the effect of treated cereals on the water quality and the invertebrate's assemblage in the form of manuscript. It is a complex of two-year monitoring of four fishponds with optimistic results of supplementary feeding of common carp by thermally treated wheat.

The aim of the following comment is to contribute to a discussion about serious topic dealing with the issue of the effect of fish farming on the water quality. These minor comments don't disparage the high quality of presented work in any way.

On the page 58, there is Governmental Decree 229/2007 in connection with fertilizing the fishponds. By my opinion, this Decree does not deal with the fishpond fertilizing but with the amendment of the Governmental Decree 61/2003 about indicators of water pollution which was amended by Governmental Decree 23/2011. The fishpond fertilizing is an issue of The Water Act 254/2001.

In the case of possible subsequent studies, I would suggest to complete the monitored chemical parameters with the establishing of organic matters.

The nutrients balance and the growth of common carp can also be influenced the composition of phytoplankton: when monitoring the presence of cyanobacteria with heterocytes which can have positive influence on the nitrogen balance and the size suitability of phytoplankton structure as the main food supply for zooplankton point of view.



Discharge of water during the fish-harvest period which includes the high budget of churned sediments rich on the phosphorus mainly is the individual chapter from the nutrients balance point of view. Such concentrations can also significantly influence a total annual phosphorus balance. The ration of phytate phosphorus in the administered fish feed has the important role from the phosphorus balance in aquatic environment point of view. This ration can significantly vary due to the nutritional rations in the growing period of cereals, the age of caryopsis, used variety etc. Higher ration of phytate phosphorus can have then the effect on the decrease of the conversion of phosphorus from the cereals by the fish.

In conclusion, as a reviewer I am appreciative of the long-term and time-expensive work which has the author of this thesis passed. It is incomparably more complicated to reach and publish relevant results from the natural environment than from the controlled laboratory conditions.

### **FINAL RECOMMENDATION**

- PhD Thesis can be recommended for defence**  
 **PhD Thesis can be recommended with reservations for defence**  
 **PhD Thesis can not be recommended for defence**

13.6.2015, Brno

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Date and place

doc. Ing. Radovan Kopp, Ph.D.

  
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Name and signature