



Review of USB FFPW PhD thesis

First name(s), surname, titles of the PhD student: Mahyar Zare, M.Sc.	First name(s), surname, titles of supervisor: Vlastimil Stejskal, doc. Ing. Ph.D.
Title of PhD thesis: Effects of herbal derived products on growth, digestibility, body composition, immune and stress response in fish	

REVIEWER:

Surname: Paolucci	Institution: University of Sannio (Italy)
Name: Marina	
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Please describe your professional relationship to the PhD student: Sharing the same academic field of study about the employment of herbal extracts on fish health in aquaculture	Please describe your field of expertise: Animal Biology, aquatic animal farming, bioactive molecules

QUESTIONNAIRE

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

Fish aquaculture is the fastest food-producing sector, with an average increase of about 6% every year. To meet the fish protein demand of the increasing population, intensive farming is a worldwide spread strategy. However, intensive practices affect heavily both the environment and the fish health. Moreover, the use of chemicals and antibiotics, necessary to keep the spreading of diseases under control, has been raising public concern among consumers. The use of herbal-derived products in place of chemicals and antibiotics to improve the growth and general health of farmed fish is strategic to the sector and in line with the European guidelines about the need to make this food-producing sector more sustainable and environmentally friendly. In this regard, the PhD thesis of Mahyar Zare holds great relevance to the sector. Currently, a limited number of herbal extracts have been used as feed additives and the research field has been extending rapidly. Thus, the results showed in this thesis are promising to the sector and of remarkable importance for both basic and applied research. In particular, the feed-producing industry may be directly interested in the results presented in this thesis.



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

The thesis is well-structured and written. The aims are clearly explained. Formally, the thesis is divided into five chapters. Chapter 1 provides a general introduction with an appropriate advanced overview of the topic of the study. Chapters 2, 3, and 4 each represent an already published paper. Chapter 5 reports a general discussion and diverse pieces of information to complete the description of the candidate's commitment. In general, experiments are adequately reported in Materials and Methods, and results are nicely presented and maturely discussed.

OVERALL COMMENTARY ON THE PhD THESIS

Please write in the box specific comments concerning the PhD thesis in extent of 1-2 pages:

This dissertation encompasses two research publications that investigated the use of nettle (*Urtica dioica*), tarragon (*Artemisia dracunculus*), and garlic (*Allium sativum*) as additives in fish diets and a review paper on nettle as a growth promoter and immuno stimulator in fish. In the general introduction, the candidate describes the state-of-art of the sector and the three herbs employed in the study. The medicinal plants were chosen due to their bioactive compounds and tested for their effects on growth performance, haematological parameters, biochemical parameters, immune response, and enhanced resistance to pathogens in fish, rainbow trout *Oncorhynchus mykiss* fingerlings, and *Perca fluviatilis* juveniles. The effects of the herbs were investigated in feeding trials carried out with different concentrations of the herbs, alone and in combination. The objectives of the thesis were clearly stated and included: 1. Investigating the effect of medicinal plant supplementation on the growth performance of fish. 2. Determining the impact of medicinal plant supplementation on the body proximate composition of fish. 3. Evaluating the hematological and biochemical blood parameters of fish-fed diets supplemented with medicinal plants. 4. Assessing the immunomodulatory effects of medicinal plant supplementation in fish. 5. Investigating the potential of diets supplemented with medicinal plants to mitigate cortisol and glucose responses induced by high-density and net handling stress.

From these studies, the candidate was able to draw the following conclusions:

The inclusion of nettle and tarragon leaf powder, alone and in combination, in rainbow trout fingerling diet promoted growth performance, body composition, haemato biochemical factors, and immune response. Specifically, a combination of nettle and tarragon leaf powders at a minimum of 10 g/kg each in the feed, or 30 g/kg of nettle leaf powder alone, was found to be optimal.

Garlic powder at a level of 10 g/kg feed improved haemato biochemical factors and nutrient digestibility, particularly fat, in European perch. Furthermore, the use of 30 g/kg feed garlic powder increased whole-body protein composition and elevated resistance against high density and net handling stress in European perch representing a promising alternative to chemical and medicinal treatments for controlling pathogens in fish.

The overall results of this thesis suggest that the use of natural feed phyto-additives could be a potential solution to address health issues in aquaculture, leading to more sustainable and



efficient food production.

I can conclude that the thesis of Mayhar Zare is a pleasurable piece of work and I do not have any critical comment about it. It is, in my opinion, suitable for the defense and Mahyar Zare deserves to be honored with the Ph.D. title.

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

July 3rd, 2023
Benevento, Italy

Prof. Marina Paolucci