Cairo University
Faculty of Veterinary Medicine
Dept. of Nutrition and Clinical Nutrition

Performance and oxidation status of Nile Tilapia (*Oreochromis niloticus*) in Response to some Dietary and Ecological Modifications

Thesis

Submitted by

Gehad Eisa Ahmed Mohamad Eisa

(B.V.Sc., Cairo University, 2012)

For

M.V.SC. degree
(Nutrition and Clinical Nutrition)

Under supervision of

Prof. Dr. Fathy Farouk Mohamed
Professor of Nutrition and Clinical Nutrition and Former dean
Faculty of Veterinary Medicine- Cairo University

Prof. Dr. Ramadan A. El-Banna
Professor of Nutrition and Clinical Nutrition
Faculty of Veterinary Medicine
Cairo University

Prof. Dr. Ahmed M. El- Ashram
Professor and Head of the of fish health and diseases dept. Faculty of Fish Resources - Suez University

2017

Cairo University
Faculty of Veterinary Medicine
Department of Nutrition and Clinical Nutrition

Supervision Sheet

Supervisors

Prof. Dr. Fathy Farouk Mohamed
Professor of Nutrition and Clinical Nutrition and Former dean
Faculty of Veterinary Medicine Cairo University

Prof. Dr. Ramadan Abdel-Montaleb El-Banna
Professor of Nutrition and Clinical Nutrition Department
Faculty of Veterinary Medicine
Cairo University

Prof. Dr. Ahmed M.M. El- Ashram
Professor and Head of the department of fish health and diseases,
Faculty of Fish Resources Suez University

2017

CAIRO UNIV.
FAC. VET.MED.

Cairo University
Faculty of Veterinary Medicine
Department of Nutrition and Clinical Nutrition

Approval sheet

This is to approve that the thesis titled

(Performance and Oxidation Status of Nile Tilapia (*Oreochromis niloticus*) in Response to Some Dietary and Ecological Modifications)

And presented by

Gehad Eisa Ahmed Mohamad Eisa

To Cairo University

For
M.V.SC. degree
(Nutrition and Clinical Nutrition)

Has been approved by the examining committee:

Prof. Dr. Wafaa Abd El- Hamid El-Eraky W. Eleraky
Professor of Nutrition and Clinical Nutrition and Dean of
Faculty of Veterinary Medicine Zagazig University

Prof. Dr. Maha Mohamed Hady Maha Hady
Professor and Head of the Department of Nutrition and Clinical Nutrition
of Faculty of veterinary Medicine, Cairo University

Prof. Dr. Fathy Farouk Mohamed Fathy F.M.
Professor of Nutrition and Clinical Nutrition and Former dean
Faculty of Veterinary Medicine Cairo University (supervisor)

Prof. Dr. Ramadan Abdel- Montaleb El- Banna Ramadan El-Banna
Professor of Nutrition and Clinical Nutrition
Faculty of Veterinary Medicine-Cairo University (supervisor)

Date: 21/1/2017

بسم الله الرحمن الرحيم

صدق الله العظيم

Cairo University
Faculty of Veterinary Medicine
Department: of Nutrition and Clinical Nutrition
Name: Gehad Eisa Ahmed Mohamad Eisa
Nationality:Egyptian
Date of birth: 20/2/1990
Place of birth: Cairo
Degree: Master
Specialization: Nutrition and Clinical Nutrition
Title of thesis: Performance and oxidation status of Nile Tilapia (*Oreochromis niloticus*) in Response to some Dietary and Ecological Modifications
Supervisiors:
Prof. Dr. Fathy Farouk Mohamed Dept. Nutrition and Clinical Nutrition
Prof. Dr. Ramadan Abdel MontalebEl Banna Dept. Nutrition and Clinical Nutrition
Prof. Dr. Ahmed M.M. El- Ashram Head of fish health and diseases Dept.
Faculty of Fish Resources Suez University

Abstract

Two experimental trials were conducted. The first feeding trial was conducted to study the impact of different Methionine sources on performance and oxidation status of Nile tilapia (*Oreochromis niloticus*) fingerlings. A total of 180 Nile Tilapia fingerlings weighing (8.2) g were randomly assigned into four equal groups with 3 replicates (each of 15 fingerlings), reared in glass aquaria, supplied with clean de-chlorinated tap water with air pumping and filtration system applied throughout the experiment. Fish in different groups were fed on 4 experimental isocaloric, isonitrogenous purified basal diets composed of corn starch, casein, gelatine and cellulose as the main components to cover the nutrient requirements of Nile Tilapia fingerlings as described by NRC feeding standards (2011). The first group (G1) was fed on basal diet without extra Met supplementation (Met deficient), the second group (G2) was fed on the same diet with DL-Met to cover the requirements, the third group (G3) was fed on the same diets with MHA-Ca (BE 88%) supplementation and the fourth group (G4) was supplemented with MHA-FA (BE 65%) The experiment lasted for 3 months. After 2 weeks which served as acclimatization period during which the suitable feeding regime were suggested to be (4% of fish biomass). Growth performance parameters were biweekly recorded. At the end of the experiment, serum samples were collected to determine some selected serum parameters including, Total Protein, Albumin, Globulin, Albumin / Globulin ratio, ALT, AST, Uric acid and Creatinine. Also samples from the homogenates hepatic tissue were collected for determination of the oxidation stress markers including reduced Glutathione (GSH), Malondialdehyde, (MDA), Catalase (CAT), Glutathione peroxidase (GPx), Glutathione reductase (GR) and superoxidedismutase (SOD) activity. Lysozomal activity and NBT (Respiratory Oxygen burst effect) were evaluated to determine the immune status.

Results revealed significant ($P< 0.05$) positive effects of either DL-Met or MHA-Ca supplementation on most of the growth performance parameters, meanwhile the Nile Tilapia (Oreochromisniloticus) responded lesser to MHA-FA than DL-Met. None of serum parameters were significantly affected with the different sources of Met. The highest (GSH), (CAT), (GPx) , (GR) and (SOD) and lowest significant MDA levels were also observed in the fish supplemented with DL-Met (G2) and those supplemented with MHA-ca (G3), followed by G3 (supplemented with MHA-FA). The non supplemented group (G1) showed the lowest levels of antioxidant enzymes and highest level of (MDA). The Dl-Met has a positive effect on the immune status through improving the lysozomal activity and Respiratory Oxygen Burst. These results confirmed the effects of different Met sources noticed on growth performance traits.

The second experimental trial was conducted to study the impact of the use of magnetized water on the same parameters described in first trial also its effect on body composition of fish at the end of experiment. A total of 180 Nile Tilapia (*Oreochromis niloticus*) fingerlings weighing (11.7) g were randomly allotted into two groups each has 6 replicates (each of 15 fingerlings), reared in glass aquaria, the first group was supplied with clean de-chlorinated tap water. Meanwhile the fish in the second group were reared in magnetized water (obtained from water magnetizer that fixed at the main water source) the aquaria in the two groups were supplied with air pumping and filtration system applied throughout the experiment. Fish in the two groups were fed on the same commercial pelleted isocaloric, isonitrogenous basal diets that were prepared to cover the nutrient requirements of Nile Tilapia fingerlings as described by NRC feeding

standards (2011). The experiment lasted for 3 months. After 2 weeks which served as acclimatization period during which the suitable feeding regime were suggested to be (4% of fish biomass).
Results revealed significant ($P< 0.05$) positive effect of magnetized water on the growth performance parameters of Nile Tilapia also the highest (GSH), (CAT), (GPx), (GR) and (SOD) and lowest significant MDA levels were also observed in the fish reared in magnetized water and higher lysozomal activity.
Finally, it could be concluded that the use of both Dl-Met and MHA-Ca supplementation had a better effects not only on growth performance, serum parameters but also alleviated oxidative stress and potentiated the immune response of Nile Tilapia (*Orochromis niloticus*) fingerlings. Knowing and understanding the relative biological value (RBV) of MHA-FA compared to DL-Met is an important precondition to cost-effective purchasing, feed formulation and fish production. In addition the use of magnetized water under intensive fish farming condition was advantageous as it has the ability to improve fish growth performance, the antioxidant defence mechanisms as well as potentiating the immune response.
Key words: Methionine, Methionine Hydroxy analogues, Nile Tilapia, performance, oxidation stress, Magnetic water.

Acknowledgement

First and foremost, I am greatly indebted in all my work and success to merciful ***ALLAH***

I would like to express my deepest thanks to ***Prof. Dr. Fathy Farouk Mohamed,*** *Professor of Nutrition and Clinical Nutrition , Faculty of Veterinary Medicine, Cairo University for his valuable advice, continuous support, generous help and intense efforts during this work, I am forever grateful for the knowledge and guidance you have given me during my Master research program.*

I wish also to extend my sincere thanks and appreciations ***to Prof. Dr. Ramadan Abdel – Montaleb El – Banna,*** *Professor and head of Nutrition and Clinical Nutrition Dept., Faculty of Veterinary Medicine, Cairo University who has guided and mentored me both in science and philosophy over the last three years for his close and effective scientific supervision, valuable and continual encouragement, and guidance during the research. Dr. El – Banna taught me how to think thoroughly, question in-depth and express sharply. His patience and support have helped me with academic achievement.*

I wish also to extend my sincere thanks and appreciations ***to prof. Dr .Ahmed M. M. El –Ashram*** *professor of fish health and diseases faculty of fish resources Suez University for his continuous help and advices throughout my work.*

I would like to express my appreciation to ***Dr. Abd El-Rahman Khataby*** *, Researcher ,Central Laboratory for Aquaculture Research for his help in fish rearing during the experiment.*

I sincerely wish to express my gratitude to ***Dr. Shaimaa Rabie Anwar,*** *Lecturer Nutrition and Clinical Nutrition, Faculty of Veterinary Medicine, Cairo University for supplying the magnetic water device.*

I sincerely wish to express my gratitude to ***Dr. Ahmed Kahter,*** *the technical sales manager ofEvonik limited Company Egypt for his help and support during this work.*

Finally, I would like to thank very much my beloved husband ***Mohammed*** *for his continuous support, generous help and intense efforts during this work.*

Special thanks appreciations to all my members of ***my family*** *(My love father, my Mother, my sister and my little angle* ***Rokaya)*** *for their continuous help, encouragement and patience during this research project and preparation of this thesis.*

Content

List of Tables