



Impact of Spirulina Supplementation on the Growth and Physiological Process in Nuna Tengra (*Mystus gulio*)

Md Sohag Sarker

Roll No: 0123/08

Registration No: 1280

Session: 2023-2024

**A thesis submitted in the partial fulfillment of the requirements for the degree of
Master of Science in Fish Biology and Biotechnology**

Department of Fish Biology and Biotechnology

Faculty of Fisheries

**Chattogram Veterinary and Animal Sciences University Chattogram-4225,
Bangladesh**

JUNE 2024

Authorization

I thus affirm that the theory is entirely my own work. I also provide Chattogram Veterinary and Animal Sciences University (CVASU) permission to lend this thesis to other organizations or people to conduct academic research. I further give the CVASU permission to photocopy the thesis or use any other method to replicate it entirely or in part at the request of any organizations or people for academic purposes. Under the limitations of the existing technology, I, the undersigned and author of this work, certify that the electronic copy of this thesis that I have given to the CVASU Library is an accurate copy of the print thesis that was submitted.

The author

June 2024

Impact of Spirulina Supplementation on the Growth and Physiological Process in Nuna Tengra (*Mystus gulio*)

Md Sohag Sarker
Roll No: 0123/08
Registration No: 1280
Session: 2023-2024

This is to certify that we have examined the above Master's thesis and have found that is complete and satisfactory in all respects and that all revisions required by the thesis examination committee have been made

.....
Joyshri Sarker
Supervisor

.....
Dr. Md. Mahiuddin Zahangir
Co-supervisor

.....
Dr. Md. Mahiuddin Zahangir
Chairman of the Examination Committee

Department of Fish Biology and Biotechnology
Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University
Khulshi, Chattogram-4225, Bangladesh

June 2024

ACKNOWLEDGEMENT

I would like to express my gratitude to the Almighty for blessing me with the strength, courage, and patience to pursue and complete my postgraduate studies and thesis for the Master of Science (MS) degree in Fish Biology and Biotechnology.

The author would like to take this opportunity to express his sincere gratitude and debt of gratitude to the Director Institute of Coastal Biodiversity, Marine Fisheries and Wildlife Research Center **Professor Dr. Mohammed Nurul Absar Khan**, for his invaluable administrative support in helping him complete his research.

The author expresses his sincere gratitude and appreciation to **Ms. Joyshri Sarker**, Associate Professor and Head, Department of Aquaculture, Chattogram Veterinary and Animal Sciences University, for his unwavering support, authoritative guidance, constructive criticism, advice, and continuing motivation.

The author also thanks **Dr. Md. Mahiuddin Zahangir**, Associate Professor, Department of Fish Biology and Biotechnology, Faculty of Fisheries at Chattogram Veterinary and Animal Sciences University, for her support that helped him become a more self-assured individual.

It is his good fortune to warmly recognize the assistance of his fellow members Joya Chakraborty, Md. Nayeem Hossain, Tarisha Maknoon, Md. Jobran Mia, Haphsa Khanom, Md. Shamim Rahman for their assistance and kind consideration during the research period. He also thanks all the employees and students. Last but not least, I want to emphasize how grateful I am to my parents and friends for their support, blessings, and sacrifice.

The Author

June 2024

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE NO.
	AUTHORIZATION	ii
	SIGNATURE PAGE	iii
	ACKNOWLEDGMENTS	iv-v
	TABLE OF CONTENTS	vi-vii
	LIST OF FIGURES	viii
	LIST OF TABLES	ix
	ABSTRACT	x
1	INTRODUCTION	1-5
	1.1. Background	1-5
	1.1. Objectives of the study	5
2	REVIEW OF LITERATURE	6-13
	2.1. Spirulina	6
	2.2. Spirulina Supplementation	6-8
	2.3. Growth Performance and Spirulina Efficiency	8
	2.4. Proximate Composition of Whole Body	9
	2.5. Hemato-biochemical Analyses	10
	2.6. Gastrointestinal Indices	11
	2.7. Histological Analysis	11
	2.8. <i>Mystus gulio</i>	12-13
3	MATERIALS AND METHODS	14-19
	3.1. Fish Collection and Husbandry	14
	3.2. Experimental Design	14
	3.3. Diet Preparation and Chemical Composition	15
	3.4. Final Sampling	16
	3.5. Hematological Parameters	17
	3.6. Calculation of Gastrointestinal Indices	17

	3.7. Growth Parameters	17
	3.8. Gonadosomatic Index (GSI)	18
	3.9. Histology of Gonad	18
	3.10. Water Quality Parameters	18-19
	3.11. Statistical Analysis	19
4	RESULTS	20-24
	4.1. Growth Performance of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	20
	4.2. Gastrointestinal Indices of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	21
	4.3. Hematological Parameters of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	22
	4.4. Gonadosomatic Index and Gonad Histology of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	23
5	DISCUSSION	25-28
	5.1. Growth Performance of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	25
	5.2. Gastrointestinal Indices of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	26
	5.3. Hematological Parameters of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	26
	5.4. GSI Indices of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	27-28
6	CONCLUSIONS	29
7	RECOMMENDATIONS	30
8	REFERENCES	31-46
9	BRIEF BIOGRAPHY	47

LIST OF PLATES

PLATE NO.	TITLE	PAGE NO.
1	Experimental Design in the Laboratory	14
2	Diet Preparation	15
3	Anesthetization of Fish	16
4	Measuring Length and Weight	16
5	Changes in the Ovarian Structures of Female <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	24

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO
1	Variations in Hepatosomatic Index of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina.	21
2	Variations in Visceral Weight of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina.	21
3	Variations in Viscerosomatic Index of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	22
4	Variations in Gonadosomatic Index of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina.	23

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
1	Composition of Experimental Diets	16
2	Water Quality Parameters Maintained during Experimental Period	19
3	Growth Performance of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	20
4	Hematological Parameters of <i>Mystus gulio</i> at Different Feeding Regimes of Spirulina	23

ABSTRACT

Spirulina, a large cyanobacterium, is a potential alternative protein source for fish. This study examines the effects of spirulina on the growth, feed utilization, and physiological processes of *Mystus gulio*, a commercially important marine fish species of the Bay of Bengal, Bangladesh. Juvenile *M. gulio* was supplemented with four different spirulina regimes such as 0%, (control, T1), 3% (T2), 6% (T3), and 9% (T4) per kg diet for seven weeks. Results showed that the experimental group T4, supplemented with 9% spirulina, had significantly higher weight gain, specific growth rate (SGR), relative growth rate (RGR), and feed conversion efficiency (FCE) compared to the control group (T1). A higher percentage of spirulina supplementations (T4 group) also showed a significantly higher hepatosomatic index (HSI) (2.071 ± 0.344) indicating improved liver function. In contrast, the lowest visceral weight (0.236 ± 0.40) and visceral somatic index (VSI) (6.54 ± 0.82) were recorded at T4 which indicates better digestibility of food. Significantly higher levels of RBC, WBC and cholesterol levels was found in spirulina-supplemented fish representing better body physiology, enhanced immunological function and altered lipid metabolism. Spirulina supplementation also had a significant impact on female gonads by increasing the gonadosomatic index (GSI) and gonadal maturity signifying the enhanced reproductive investment and potential improvements in fecundity and spawning outcomes. The findings of the present study highlight Spirulina as a beneficial feed additive for enhancing growth performance in *Mystus gulio*, reducing feed costs, and promoting sustainability in aquaculture.

Keywords: Spirulina, feed, aquaculture, growth, physiology, reproduction, *Mystus gulio*