



EFFECTS OF NATURAL CAROTENOIDS ON THE BODY COLORATION OF SWORD TAIL FISH (*Xiphophorus hellerii*)

Abdulla Al Bari

Roll No.: 0119/01

Registration No.: 719

Session: 2019-2020

**A thesis submitted in the partial fulfillment of the requirements for the degree of
Master of Science in Fisheries Resource Management**

**Department of Fisheries Resource Management
Faculty of Fisheries
Chattogram Veterinary and Animal Sciences University
Chattogram-4225, Bangladesh**

June 2020

Authorization

I hereby declare that I am the sole author of the thesis. I also authorize the Chattogram Veterinary and Animal Sciences University (CVASU) to lend this thesis to other institutions or individuals for the purpose of scholarly research. I further authorize the CVASU to reproduce the thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

I, the undersigned, and author of this work, declare that the electronic copy of this thesis provided to the CVASU Library, is an accurate copy of the print thesis submitted, within the limits of the technology available.

Abdulla Al Bari

June, 2020

**EFFECTS OF NATURAL CAROTENOIDS ON
THE BODY COLORATION OF SWORD TAIL
FISH (*Xiphophorus hellerii*)**

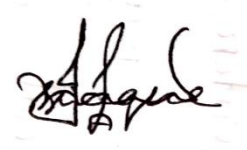
Abdulla Al Bari

Roll No.: 0119/01

Registration No.: 719

Session: 2019-2020

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



Dr. Sk. Ahmad Al Nahid
Supervisor

Sk. Istiaque Ahmed
Co-supervisor

Dr. Sk. Ahmad Al Nahid
Chairman of the Examination Committee

Department of Fisheries Resource Management
Faculty of Fisheries
Chattogram Veterinary and Animal Sciences University
Chattogram-4225, Bangladesh

June 2020

ACKNOWLEDGEMENTS

All the praises and thanks to Allah, the Almighty, most gracious, most merciful, most benign who has enabled him to pursue the study in fisheries science successfully as well as to submit the thesis for the degree of Master of Science (MS) in Fisheries Resource Management and also pay gratitude to the Almighty for enabling and giving strengths to complete research work as well as thesis within due course of time.

*The author expresses his gratitude and indebtedness to Vice-Chancellor, Professor **Dr. Goutam Buddha Das** and Dean, Professor **Dr. Mohammad Nurul Absar Khan** from the bottom of his heart for their immense administrative support to complete his research work,*

*The author expresses his deepest sense of gratitude and sincere appreciation to his honorable teacher and research supervisor, **Dr. Sk. Ahmad Al Nahid**, Associate Professor and Head, Department of Fisheries Resource Management, Chattogram Veterinary and Animal Sciences University, Chattogram for his unfailing support, authoritative guidance, constructive criticism, advice and continuous motivation.*

*The author also sincerely expresses his gratitude to his co-supervisor, **Mr. Sk. Istiaque Ahmed**, Assistant Professor, Department of Fisheries Resource Management, Chattogram Veterinary and Animal Sciences University, Chattogram for his valuable guidance to teach him to be more confident person.*

*The author expresses his thanks to **Mrs. Tasnuba Hasin**, and **Mrs. Shahida Arfine Shimul**, Assistant Professor, Department of Fisheries Resource Management, Chattogram Veterinary and Animal Sciences University, Chattogram for valuable and constructive suggestions during the research work,*

*It's his fortune to gratefully acknowledge the support of his friends **Md. Saifuddin Rana**, **Md. Abu Naeem**, **Md. Afsar Hossain**, **Md. Arifur Rahman**, and **Md. Maksudur Rahman** for their support and generous care throughout the research tenure also thanks all students and staff. Last but not least, I express my deepest sense of gratitude to my beloved parents and friends for their sacrifice, blessings and encouragement.*

The Author

CONTENTS

CHAPTER	TITLE	PAGE NO.
	AUTHORIZATION	ii
	ACKNOWLEDGEMENTS	iv
	LIST OF TABLES	vii
	LIST OF FIGURES	viii
	LIST OF PLATES	ix
	LIST OF APPENDICES	x
	LIST OF ABBREVIATIONS	xi
	ABSTRACT	xii
1	INTRODUCTION	1-4
2	REVIEW OF LITERATURE	5-8
3	MATERIALS AND METHODS	9-23
	3.1 Description of experimental design	9
	3.2 Aeration	9
	3.3 Cleaning and siphoning	9
	3.4 Collection of experimental fish	9
	3.5 Experimental design	10
	3.6. Stocking of fish	10
	3.7 Feed formulation and preparation	10
	3.7.1 Selection and collection of natural carotenoid sources	10
	3.7.2 Collection of raw ingredients	11
	3.7.3 Preparation of mixed feed	11
	3.7.4 Feed proximate analysis	11
	3.8 Feeding of fish	11
	3.9 Sampling	12

	3.10 Measurement of carotenoid	12
	3.11 Growth performance	13
	3.12 Water quality parameters	13
	3.13 Statistical analysis	13
4	RESULTS	24-29
	4.1 Total carotenoid gain in fish tissue	24
	4.2 Effects of marigold on growth	25
	4.3 Effects of marigold on length	27
	4.4 Effects of marigold on survival rate	29
	4.5 Water quality parameters	29
5	DISCUSSION	30-32
	5.1 Total carotenoid gain in fish tissue	30
	5.2 Effects of marigold on growth, length and survival rate	31
6	CONCLUSIONS	33
7	RECOMMENDATION AND FUTURE PERSPECTIVES	34
	REFERENCES	35-39
	APPENDICES	41-44
	BRIEF BIOGRAPHY	45

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
1	Layout of the experiment showing the distribution of 'sword tail' fishes in tank and the applied treatments	10
2	Proximate composition of raw feed and raw carotenoid content	11
3	Proximate composition of carotenoid content mixed feed	11
4	Growth performance, length and Carotenoid gain of experimental fish under different treatments	28
5	Water quality parameters	29

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE NO.
Figure 1	Weekly carotenoids gain of sword tail Fish	24
Figure 2	Effects of carotenoid on sword tail in terms of carotenoids gain under different treatments	25
Figure 3	Weekly weight data of Sword tail Fish	26
Figure 4	Effects of carotenoid on the growth (weight gain) of sword tail under different treatments	26
Figure 5	Weekly length gain of sword tail under different treatments	27
Figure 6	Final length gain data of sword tail under different treatments	28
Figure 7	Survival rate data of sword tail under different treatments	29

LIST OF PLATES

PLATES NO.	TITLE	PAGE NO.
1	Experimental setup	14
2	Experimental fish collection	14
3	China rose sample	15
4	Marigold flower sample	15
5	Carrot sample	16
6	Weight of carotenoids sample	16
7	Prepared carotenoids mixed feed	17
8	Prepared carotenoids mixed feed	17
9	Feeding of fish	18
10	Siphoning	18
11	Weight of fish	19
12	Sample preparation for analysis	19
13	Proximate composition analysis of prepared feed	20
14	Proximate composition analysis of prepared feed	20
15	Proximate composition analysis of prepared feed	21
16	Titration of experimental feed	21
17	Sacrifice of fish	22
18	Take 1-gram fish sample in test tube	22
19	Keep sample in refrigerator	23
20	Measurement of carotenoid absorption of experimental species	23

LIST OF APPENDICES

APPENDIX NO.	TITLE	PAGE NO.
1	Carotenoid absorption data of the fishes at different sampling	40
2	Weight data of the fishes at different sampling	40
3	Length data of the fishes at different sampling	41
4	Carotenoid gain data of the fishes at different weeks	42
5	Weight gain data of the fishes at different weeks	42
6	Length gain data of the fishes at different weeks	43
7	Average carotenoid absorption data of fishes per treatment per week	43
8	Average weight data of fishes per treatment per week	44
9	Average length (cm) data of fishes per treatment per week	44

ABBREVIATIONS

ANOVA	Analysis of Variance
cm	Centimeter
DoF	Department of Fisheries
<i>et al.</i>	Associates
gm	Gram
Mg	Milligram
i.e.,	That is
kg	Kilogram
S.D.	Standard deviation
SPSS	Statistical package for social science
°C	Degree Celsius
FAO	Food and Agriculture Organization
%	Percent
wt.	Weight
w	Week
FCR	Feed Conversion Ratio
CF	Condition Factor
SGR	Specific Growth Rate
MT	Metric ton
Cal	Calorie

ABSTRACT

The effect of natural carotenoids obtained from China Rose Flower (*Hibiscus rosa-sinensis*), Carrot (*Daucus carota*), and Marigold Flower (*Tagetes erecta*) meal on colour, growth and development of *Xiphophorus hellerii* were investigated for a period of 120 days. The experiment was conducted in aquarium like plastic tank with recirculation facilities in the Wet Laboratory of the Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University. Natural carotenoids leaf meal was substituted for fish meal at 15% control (T₀), 15 % China rose(T₁), 15% Marigold (T₂) and 15% Carrot(T₃) in the four different diets. Swordtail fish were randomly distributed into glass like plastic tank aquarium at eight (8) fish per aquarium in triplicate treatments and were fed twice daily for 17 weeks. The average initial carotenoids of fishes in four treatments were 0.083±0.0621mg/10kg, 0.085±0.0457 mg/10kg, 0.085±0.0214 mg/10kg and 0.084±0.0105 mg/10kg in T₀, T₁, T₂ and T₃ respectively. At the end of the 120 days experimental period average final carotenoids of the fishes of four treatments were 0.174±0.085 mg/10kg, 0.205±0.095 mg/10kg, 0.352±0.205 mg/10kg and 0.234±0.112 mg/10kg in treatments T₀, T₁, T₂ and T₃ respectively. In case of carotenoids gain higher result was found in T₂ (marigold) (0.352±0.205 mg/10kg) followed by T₃, T₁ and T₀ and the lower carotenoid gain result found in T₀ (control). The average initial weight in four treatments were 3.413±0.0742 gm, 3.213±0.0875 gm, 3.31±0.0324 gm, 2.313 gm±0.0291 in T₀, T₁, T₂ and T₃ respectively. At the end of the 120 days experimental period, average final weight of the fishes of four treatments were 4.455±0.821 gm, 3.504±0.219 gm, 3.764±0.727 gm and 2.776±0.418 gm in treatments T₀, T₁, T₂ and T₃ respectively. In case of weight gain higher result was found in T₀ (4.455±0.821 gm) followed by T₃, T₂ and T₁. In case of length gain higher result was found in T₀ (3.594±0.250 cm) followed by T₃, T₂ and T₁. Experimental fish showed good performance in T₂ treatment in which survival rate was about 100% and the lowest performance was showed in T₁ treatment. The result concluded that natural carotenoids (marigold flower) have positive impacts on the body coloration of sword tail fish.

Key words: Carotenoids, Sword-tail, Treatment, Growth performance