EFFECTS OF LAPSI (*Choerospondias axillaris* Roxburg) ON SURVIVAL, GROWTH PERFORMANCE AND PROTEIN PROFILE OF NILE TILAPIA (*Oreochromis niloticus* Linnaeus, 1758) CULTURED UNDER LABORATORY CONDITIONS

Amit Shrestha

T.U. Registration No: 5-2-48-1409-2008

T.U. Examination Roll No: 21675

Batch: 2068/2069

A thesis submitted in partial fulfillment of the requirements for the award of the degree of Master of Science in Zoology with special paper Fish and Fisheries.

Submitted to

Central Department of Zoology

Institute of Science and Technology

Tribhuvan University

Kirtipur, Kathmandu

Nepal

November, 2015

RECOMMENDATIONS

This is to recommend that the thesis entitled "EFFECTS OF LAPSI (*Choerospondias axillaris* Roxburg) ON SURVIVAL, GROWTH PERFORMANCE AND PROTEIN PROFILE OF NILE TILAPIA (*Oreochromis niloticus* Linnaeus, 1758) CULTURED UNDER LABORATORY CONDITIONS" has been carried out by Amit Shrestha for the partial fulfillment of Master's Degree of Science in Zoology with special paper Fish and Fisheries. This is his original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date……

Dr. Shyam Narayan Labh, Ph.D
Professor
Department of Zoology,
Amrit Science Campus
Tribhuvan University
Lainchaur, Kathmandu, Nepal

LETTER OF APPROVAL

On the recommendation of supervisor "Prof. Dr. Shyam Narayan Labh" this thesis submitted by Amit Shrestha entitled "EFFECTS OF LAPSI (*Choerospondias axillaris* Roxburg) ON SURVIVAL, GROWTH PERFORMANCE AND PROTEIN PROFILE OF NILE TILAPIA (*Oreochromis niloticus* Linnaeus, 1758) CULTURED UNDER LABORATORY CONDITIONS" is approved for the examination and submitted to the Tribhuvan University in partial fulfillment of the requirements for Master's Degree of Science in Zoology with special paper Fish and Fisheries.

Date……

Prof. Dr. Ranjana Gupta, Ph.D
Head of Department
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Amit Shrestha entitled "**EFFECTS OF LAPSI (*Choerospondias axillaris* Roxburg) ON SURVIVAL, GROWTH PERFORMANCE AND PROTEIN PROFILE OF NILE TILAPIA (*Oreochromis niloticus* Linnaeus, 1758) CULTURED UNDER LABORATORY CONDITIONS**" has been accepted as a partial fulfillment for the requirements of Master's Degree of Science in Zoology with special paper Fish and Fisheries.

EVALUATION COMMITTEE

.....	.....
Supervisor	Head of Department
Dr. Shyam Narayan Labh, Ph.D.	Dr. Ranjana Gupta, Ph.D.
Professor	Professor
……	……
External Examiner	Internal Examiner

Date of Examination:

DECLARATION

I hereby declare that the work presented in this thesis has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the author(s) or institution(s).

Date……..

Amit Shrestha

ACKNOWLEDGEMENTS

It is my great pleasure to express few words of acknowledgement to my respected supervisor Prof. Dr. Shyam Narayan Labh, Department of Zoology, Amrit Science Campus, TU, Lainchaur. This work, which came in the form of M.Sc. Degree Dissertation today, is all due to his knowledge of the subject, academic thinking, exceptional interpretations, exhaustive effort, continuous inspirations and painstaking correction.

I am also grateful to the respected madam Prof. Dr. Ranjana Gupta, Head of Central Department of Zoology for her invaluable suggestions and encouragement to pursue the work. My sincere thanks go to all the faculties and staff of Central Department of Zoology.

I am thankful to Associate Prof. Shubha Ratna Shakya for providing me the experimental materials to conduct the experiment in lab.

My sincere thanks also go to Ms. Rushila Chitrakar, Medical Lab technician at Department of Biochemistry, Tribhuvan University Teaching Hospital, whose kind cooperation and noble guidance, acted as foundation of this study.

I am extremely obliged to Lecturer Dr. Daya Ram Bhusal for helping me to analyze the data using software “R”.

ABSTRACT

This research was carried out to evaluate the efficacy of Lapsi *Choerospondias axillaris* on survival, growth performance and protein profile of Nile Tilapia *Oreochromis niloticus* cultured under laboratory conditions. A number of 252 fish of size 2.7±0.17 cm and 0.284±0.37 g were stocked into four rectangular glass aquaria with replicate forms. Fish were fed with diet containing different composition of LFPP; 0 mg/Kg (T1), 100 mg/Kg (T2), 200 mg/Kg (T3) and 400 mg/Kg (T4) for 10 weeks. The results showed statistically significant ($P<0.05$) increased mean final length, mean weight gain and specific growth rate (SGR) of Nile Tilapia in all groups fed with LFPP in comparison to control diet (T1). An inverse relation was found between FCR and the dose of LFPP contained in the diets. The FCR was found to be lowest in the fish fed with diet T3 as compared to others. It was also observed that fish fed with LFPP exhibited significant increase in total protein and globulin in the liver which may be considered as a sign of improvement in immune system. It may be due to presence of vitamin C in LFPP which act as an antioxidant. The high survival rate in the fish may be due to enhancement in the immune system. From the result obtained, it can be concluded that 200 mg/Kg of LFPP is the optimal amount needed to be supplemented for maximum growth and other dietary performance but, supplementation of more than 200 mg/Kg of LFPP in the diet improves the immune system of Nile Tilapia.

Key words: Lapsi *Choerospondias axillaris*, Nile Tilapia *Oreochromis niloticus*, growth, protein, immune system.

CONTENTS

	Pages
Declaration	**i**
Recommendations	**ii**
Letter of Approval	**iii**
Certificate of Acceptance	**iv**
Acknowledgements	**v**
List of tables	**vi**
List of figures	**vi**
List of Appendices	**vii**
List of Abbreviations	**ix**
Abstract	**xi**
1. INTRODUCTION	**1**
1.1. General background	**1**
1.2. Aquaculture in Nepal	**1**
1.3. Statement of the problem	**2**
1.4. Lapsi as an herbal medicine	**3**
1.5. Experimental fish	**4**
1.6. Objectives of the study	**5**
1.7. Limitations	**5**
2. LITERATURE REVIEW	**6**
2.1. Tilapia culture in Nepal	**6**
2.2. Some medicinal plants as immunostimulants	**7**
2.3. Antioxidant properties in fruits and herbs	**12**
2.4. Effects of fruits and herbs on fish growth	**13**
2.5. Feeding fruits/ herbs and protein profile of fish	**15**
2.6. Feeding fruits/ herbs and fish immune system	**17**
3. MATERIALS AND METHODS	**20**
3.1. Experimental design and setup	**20**
3.1.1. Selection of sites and study area	**20**
3.1.2. Culture Tanks	**20**

3.1.3. Preparation of Lapsi supplemented artificial diets **21**
3.1.4. Selection of experimental Fish for experiments **22**
3.1.5. Culture period and conditions **22**
3.1.6. Sample Collection and Examination Procedure **22**
3.2. Experimental parameters **22**
3.2.1. Fish survival **23**
3.2.2. Growth performance **23**
3.2.3. Biochemical Parameters **23**
3.3. Statistical Analysis **24**
4. RESULTS **25**
4.1. Growth performance **25**
4.1.1. Survival rate (%) **25**
4.1.2. Final Average Length and length gain (%) **26**
4.1.3. Final Average Weight and Weight gain (%) **27**
4.1.4. Specific Growth Rate (%) **29**
4.1.5. Feed Conversion ratio (FCR) and Feed Conversion Efficiency (FCE) **29**
4.2. Biochemical Parameters **31**
4.2.1. Total protein in liver of Nile Tilapia **31**
4.2.2. Albumin in liver of Nile Tilapia **31**
4.2.3. Globulin in liver of Nile Tilapia **32**
4.2.4. Ratio of albumin and globulin in liver of Nile Tilapia **33**
5. DISCUSSION **35**
5.1. Growth performance of Nile Tilapia **36**
5.2. Protein profile of Nile Tilapia **38**
6. CONCLUSION AND RECOMMENDATIONS **40**
7. REFERENCES **42**
Appendix I **57**
ESSENTIALS PHOTOPLATES **58**

LIST OF TABLES

Table	Title of tables	Pages
1	Summary of fish production in Nepal	2
2	Ingredients of basal diet used during the experiment	21

LIST OF FIGURES

Figure	Title of figures	Pages
1	Experimental designed for the culture of fish.	**20**
2	Survival rate of Nile Tilapia fed with diet containing four different doses of LFPP.	**25**
3	Final length of Nile Tilapia fed with diet containing four different doses of LFPP.	**26**
4	Percentage length gain of Nile Tilapia fed with diet containing four different doses of LFPP.	**27**
5	Average weight gain of Nile Tilapia fed with diet containing four different doses of LFPP.	**28**
6	Percentage weight gain of Nile Tilapia fed with diet containing four different doses of LFPP.	**28**
7	Specific growth rate (SGR) of Survival rate of Nile Tilapia fed with diet containing four different doses of LFPP.	**29**
8	Feed conversion ratio (FCR) of Nile Tilapia fed with diet containing four different doses of LFPP.	**30**
9	Feed efficiency ratio of Nile Tilapia fed with diet containing four different doses of LFPP.	**30**

10	Concentration of total protein in the liver of Nile Tilapia fed with diet containing four different doses of LFPP.	**30**
11	Concentration of albumin in the liver of Nile Tilapia fed with diet containing four different doses of LFPP.	**31**
12	Concentration of globulin in the liver of Nile Tilapia fed with diet containing four different doses of LFPP.	**32**
13	Concentration of ratio of albumin and globulin in the liver of Nile Tilapia fed with diet containing four different doses of LFPP.	**33**

LIST OF PHOTOGRAPHS

Photograph	Title of photograph	Pages
1	Electric weighing machine	**58**
2	Measuring length of fish	**58**
3	Measuring length of fish	**58**
4	Measuring weight of fish	**58**
5	Culture condition	**58**
6	Changing water	**58**
7	Feeding diet to fish	**59**
8	Weighing feed	**59**
9	Dissection of fish	**59**
10	Weighing liver of fish	**59**
11	Sample for homogenization	**59**
12	Centrifuging machine	**59**

LIST OF APPENDICES

Appendix	Title of appendix	Pages
I	Results of Nile Tilapia *O. niloticus* fed with various doses of LFPP.	**57**

LIST OF ABBREVIATIONS

Abbreviated form	Details of abbreviations
µL	Micro liter
A/G	Albumin/Globulin
AA	Ascorbic Acid
BCG	Bromo Cresol Green
BHA	Butylatedhydroxy Anisole
BHI	Butylatedhydroxy Toluence
DNA	Deoxyribonucleic Acid
DoFD	Directorate of Fisheries Division
EF	Fermented products of chicken egg
FAO	Food and Agricultural Organization
FCE	Feed Conversion Efficiency
FCR	Feed Conversion Ratio
FVP	Fermented Vegetable Product
G	Gram
g/dl	Gram/ deciliter
g/Kg	gram/Kilogram
GDP	Gross Domestic Product
GT	Green Tea
Ha	Hectare
Hb	Haemoglobulin
HCL	Hydrochloric acid
IgM	Immunoglobulin
LATP-Ca	L-ascorbate 2- Triphosphate Calcium
LFPP	Lapsi Fruit Pulp Powder
mg/Kg	milligram per Kilogram
MPO	Myeloperoxidase production
MS	Tricaine methane sulfonate
Mt	Metric tone
PL	Phospholipids

RNA	Ribonucleic acid
RNI	Reactive Nitrogen Intermediate
ROS	Reactive Oxygen Species
Roxb	Roxburgh
RPS	Relative Percent Survival
SGR	Specific Growth Rate
SRBC	Sheep Red Blood Cell
TEC	Total Erythrocyte count
TLC	Total Leucocytes Count
WSD	White Spot Disease
WSSV	White Spot Syndrome Virus