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Lipid Profile Alterations in Different Tissues of Channa *punctatus*, During Different Periods of Fasting and Refeeding

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Abstract*—**Many animals undergo starvation every year for environmental reasons**.** Animals respond to starvation by changing their biochemical and physiological systems in adaptive ways that trigger the loss of body weight due to a lack of food. The organism tries to conserve energy by reducing the number of calories. In this study, *Channa punctatus* **was** administered for fasting periods of 7, 14, 21, and 28 days and refeeding periods of 7, 14, 21, and 28 days. The findings confirmed that after 7 days of fasting, liver lipids depreciated but recovered after 7 days of refeeding. Mobilization of lipids occurs in the muscle tissue after 14 days, and these reserves begin to re-establish themselves after 21 days of refeeding. However, after starvation, the lipid content in the muscle, gills, and kidney was reported in decreasing order, and the lipid profile concentration level increased after 28 days of refeeding in these tissues. Notably, the alterations in the metabolism of lipids through these stages can be considered survival approaches used by *Channa punctatus.** The alteration in the metabolic profile of the tissues, that influences in the stages of fasting, and the types of assets mobilized were all evidence.

Keywords— Starvation, Lipids, Metabolism, Refeeding, Channa punctatus

I. INTRODUCTION

Many fish species experience and sustain starvation in their native habitat as a result of many circumstances like temperature, spawning, migration, and reproduction. The discovery of lipid as a source of energy for metabolism in fish has revealed its importance during periods of stress, especially starvation. Fish subsequently utilize their endogenous reservoirs to acquire the energy they need to continue their vital functions. Fish significantly rely on lipid stores accumulated throughout the feeding season during the overwintering phase. Water, protein, lipids, minerals, lower amounts of carbohydrates and in-organic elements like sodium, potassium, and phosphates (ash) constitute the body parts of fish [1]. The primary source of stored lipids, particularly triglycerides is an energy source for supporting the operational capabilities of fish during starvation [2]. Most fish consume proteins from muscle as a major source of energy [3]. While some species of fish inherit considerable environmental alternations in their metabolic pathways to preserve body-stored proteins at the cost of lipid or glycogen reservoirs [4]. As an illustration, in the early period of starvation, lipids and glycogen are used by the Esox Lucius [5].

The aim of our present study is to investigate the traits of lipid profile adjustments in Channa *punctatus* (freshwater fish) during different stages of fasting and refeeding.

II. RELATED WORK

As we know, fishes are rich in the protein content; people prefer to use them in diet. The fishes undergo several changes, as season changes some fishes species starts migration for reproduction and other species undergo starvation. The study on starvation of fishes was done time by time; the published work on starvation is seen in the year of 1913 and work is still in progress [6]. Till date a number of researchers work on different parameters of fishes during the starvation period. Morris studied the effect on starvation on metabolism of metabolism of fishes. Some authors also work on the short period starvation and refeeding for growth measurement like enzyme activities, haematological parameters and immune responses [7].Most researcher focus on the impact on oxidative stresss by starvation [8]. Some researchers of central India work on biochemical aspects of labeo-rohita during starvation [9].In other states of India the work on Starvation and refeeding may be done but not sufficient data is available in the Vidarbha area of Maharashtra. The main objective of this work is to analysis the lipid content in different Tissues of Channa punctatus during different starvation and refeeding periods.

III. MATERIAL AND METHODS

Thirty Channa panctatus were used for experimental purposes. The fish were acclimatized in glass aquaria

(40"×20"×15") for a period of 20 days in laboratory conditions. In the meantime, they were repeatedly fed a common fish diet. The experiment lasted 56 days. The fish were separated into two groups of 15 individuals each: control and starved. Throughout the experiment, the control group was fed continuously. The starvation group was subjected to starvation for 28 days in water with a neutral pH value. 28 days later, the starved fish are re-fed with the boiled egg and also with commercial diets. For estimation of total lipid (cholesterol) by Barner, Black stook method was used.

Using statistical software SPSS and Microsoft Excel, the available data was subjected to one-way ANOVA for statistical analysis. The data are untaken as Mean ± Standard Deviation (SD). The significance level was set at P<0.05

IV. Results and Discussion

The observed data for entire lipid in several tissues of control an experimental set along with standard deviation are set in **Table No.1** and graphically represented in **figure 1**listed below

Table.1: Lipid content in 100mg of different wet tissue of Starved Channa *Panctatus*

Tissues	Control	7 Days	14 Days	28 days
Muscle	102.14 ± 1.08	95.162* ± 1.59	87.35 ±5.92	70.95* ± 1.37
liver	197.05 ± 0.54	191.88* ± 0.85	180.64* ± 2.03	158.76 ± 1.99
Kidney	54.524 ± 0.99	51.94* ± 1.22	39.49 ±2.20	28.79* ± 1.74
Gills	130.95 ± 1.62	122.47* ± 1.97	113.25* ± 1.44	99.8* ±1.62

***Indicates the Significant Value*

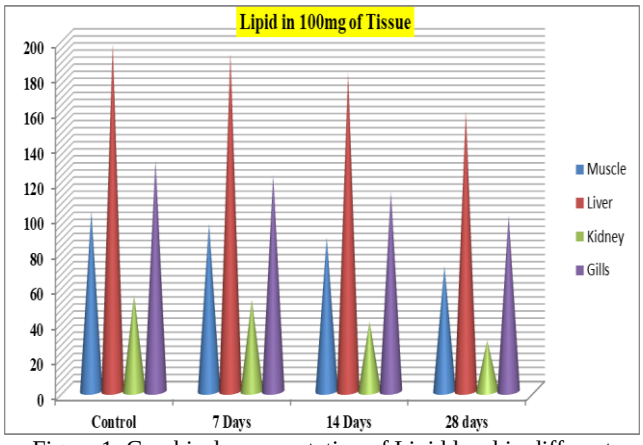

Figure.1: Graphical representation of Lipid level in different tissues of the starved *Channa punctatus.*

In control stage of the allocated Fish, the overall lipid profile were in sequence of **Liver > Gill > Muscle > Kidney** respectively. In current study, it is detected that the lipid profile in liver, gill, muscle, and kidney of fish were substantially reduced (P < 0.05) at various period of deprivation stages. This decrease of lipid content may due to rapid consumption of triglycerides to acetyl coenzyme A to energy boosters for the starvation period. This breakdown of lipid to different intermediates give energy for the period of 28 days of starvation, causes the fish to be hypolipidmic and hypoglycemic.

Table.2: Lipid content in 100mg of wet tissue of Refeeded *Channa punctatus.*

Tissue	Control	7 Days	14 Days	28 days
Muscle	102.14 ± 1.08	72.11 ±1.55	81.36* ± 2.35	93.34* ± 1.71
Liver	197.05 ± 0.54	172.33* ± 1.35	183.07* ± 2.40	193.1 ±1.58
Kidney	54.52 ±0.99	36.19 ±2.07	43.34* ± 1.80	57.26 ±1.57
Gills	130.95 ± 1.62	106.19 ± 1.59	113.42* ± 1.83	123.74* ± 1.07

** Indicates the Significant Value*

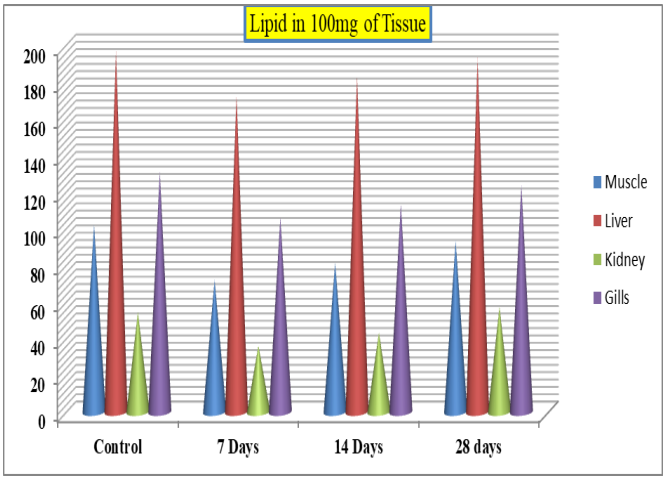

Figure.2: Graphical representation of Lipid level in different tissues of the Refeeded *Channa punctatus.*

In Refeeded fish the overall lipid profile were in the sequence of Liver > Gill > Muscle > Kidney. In contemporary study it is detected that the lipid content in liver, gill, muscle, and kidney of fish were considerably increased (P < 0.05) at different exposure period. This indicates after the refeeding the fish again gain the spontaneous increase of lipid in the said tissues. The reason behind may be due to increase accumulation of triglycerides content in the liver, gills, muscle and kidney. Another reason may be the insulin resistance developed the tissues which cause the fishes to be hyperlipidemic, hyperglycaemic and hyperinsulinemic.

Discussion

Every year, numerous species of fish are subjected to a regular period of body tissue reduction due to starvation. In order to survive, fish can breakdown vast amounts of energy assets and body tissues without permanent

destruction. Apart from carbohydrates, lipids are the first category of substances that are broken down to provide energy during starvation. Cyprinus carpio, a species of fish, is an example in which carbohydrates are utilised after lipids or proteins [10].

In our study, it has been recorded that the level of lipid gets decreased in the liver more frequently as compared to the muscle, gills, and kidney. Fernando *et al.,* [11] also found the same results in his researcher study, from the muscle tissue the lipid was first mobilized but no net alteration occurs in protein synthesis. This is in contradiction to the observation by Luo *et al*. [12] in the channel catfish (*Ictalurus punctatus*) that during starvation, the rough protein of muscle showed a greater degree of degeneration than that of crude lipid in muscle; and muscle glycogen continued to be comparatively constant. During starvation, it has been reported in rainbow trout and *Tilapia nilotica* that the increased level of both poly unsaturated fatty acid and omega 3 fatty acid (DHA) in TGA in blood while as the mobilization of lipid in tissues occurs to become hypolipidemic in nature [13] which indicates to prove the level of lipid in different tissues decreased by significantly manner in our work. Friedrich and Stepanowska, [14] investigated in starved Carp that lowlevel of TAG and total lipid concentrations(LDL),while as HDL get raised to some extent, similar metabolism reports have been seen in the fish *N.coriiceps* during the period of starvation. Prolonged starvation brought significant alternations in chemical composition and biochemical change in the enzymes which is responsible for different functions of the fish body. The lipid content in the body get direct decreased due to food shortage [15, 16, 17] which is the evidences to verify our research work. On the other hand after refed the amount of lipid get increased with less period of time, which indicates that the excess glycogen get converted into omega 3 fatty acid and lipid deposited in the different tissues.

V. CONCLUSION

During four weeks of starvation in *Channa pantatus*, reduced blood triacylglycerol (TAG) and total cholesterol (LDL and HDL) concentrations, and a reduction in body lipid profile, were detected. The non-appearance of mortality and the good health condition of the fish indicate that it (*Channa panctatus*) can survive long periods of food shortage. After refed the fish, it is notably shows the accelerated the lipid dumping in different tissue and the weight also get increased in less period of time. Movement of *Channa panctatus* also get increased this is due to the RBCs count increased which indirectly indicates the lipid is available for membrane formation of RBCs.

Conflict of interests: The authors declare no competing financial interest**.**

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