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BIOCHEMICAL CONSTITUTES OF A FRESHWATER AIR BREATHING FISH ANABUS TESTUDINEUS (BLOCH)

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ABSTRACT

Toxicants affect organically active molecules, i.e. carbon, protein and lipid substances. Carbon, protein and lipid metabolism of fish are disrupted by oxidative stress and are known to cause increases or decreases in biochemical tissue components.

KEYWORDS:*Anabas testudineus, biochemical parameters, carbohydrate, protein, lipid.*

INTRODUCTION :

The air respiratory structures in freshwater fisheries were reported to have evolved as an adaptation to hypoxic water conditions due to extreme periodician dryness during the late Silurian or early Devonian periods (Smith, 1931; Johansen, 1970).Recent air respiratory fish studies have shown that various types of morphological and physiological adaptations have allowed fish to use. These fish are engineered in a manner that maximises their morphological and physiologic adaptations to their environment.

A typical measure of nutritional value and physiological status of fish and their environment is the chemical makeup of protéins and lipids[1-2]. It is well known the value of fish as a high-quality source of nutritious, easily digestible protein , vitamins and polysaturated fatty acids[3]. Fish are essential sources of high-quality protein and other organic products. It is the most essential source of animal protein and has been generally recognised for the maintenance of a healthy body as a good source of protein and other elements.

Fish is a high protein food eaten as a result of its high palatability, its low cholesterol level and its tender meat by a significant proportion of population. It is the cheapest supply of animal protein and other important foodstuffs, particularly in the low and middle income groups, necessary for human diets. In most species, the existence and quality of the nutrients primarily depend on their type of food. Furthermore, the dietary composition of the flesh of a specific animal influences considerably the feeding habits. Approximately 85-90% fish protein is digestible and the fish flesh contains all essential dietary amino acids. In order to ensure food regulatory standards, measurements of some close composition, including protein and fats content, are often required.Fish are also a major source of mineral ingredients required for human diets[5]. Species found in South Asian rivers, swimming pool, ditches, rice fields are carnivores. BatrachusClarias, Punctatus Channa and Testudineus Anabas. It is locally known as 'Magur,' 'Gadisha,' and 'Kau,' respectively. These are also used in traditional medicine [6]. Development, growth, biochemical and physiological condition are key factors in the determination of species, durability, survival and availability. Changing early biological processes, molecular and cellular, which involves lipid peroxidation, antioxidant status, a mixed function oxidase mechanism and a general physiological indicator like growth[7-8], generally precede a higher level impact of toxins, such as contaminants, ecosystems, and the ecological system and lead to variation in proximate tissue composition.

MATERIALS AND METHODS

Separation of required organs: Fresh sample of fish for chemical analyses was gutted, washed, filtered, thinly hacked and homogenised. Three safe organisms of varying size and weight groups have been chosen for the study over the course of each month during the experiment. Triplicate analysis was carried out on all samples. The changes in the feeding behaviour, and in the environment, which can affect the general biochemical composition of the three different fish, may be the cause of a difference in the close fraction.

For five minutes, they were handled for sleeping disinfection with 5 percent KmnO4. The current research was performed between November 2014 and October 2015. The fish weighing 35 to 90 gms have been chosen to maintain a steady temperature of 27 ± 1 ° C in the laboratory conditions under ClariaBatrachus, 35-150 gm for CHanna Punctatus and 50-95 gms for *Anabas Testudineus.*

BIOCHEMICAL STUDIES

Controlling and experimental fish groups have analysed biochemical studies such as total carbohydrates, total proteins and total lipids. Anabas tissues of the control and experimental groups were chosen, e.g., gill, muscle, liver, intestine and kidney, for the present analysis.

The Lowry et al. method of estimating protein [9]. Protein was used. Freshly weighted (100 mg) organ tissue with 5% trichloroacetic acid in homogenizer have been homogenised. The homogeneous substances were centrifuged for 10 minutes at 3000rpm and the residue dissolving at 0.1N NaOH. Using 0.1NN NaOH, up to 1ml was exactly 0.2ml from this solution. This has been followed by a detailed mixing of 3.5ml of Folin's reagent. The optical density in a Spectronic 20 spectrometer was estimated at 670 nm after 30 minutes of rest.

STATISTICAL ANALYSIS:

The collected data was statistically tested using medium ± S.D (standard default) for the experimental parameters. One method of analysing ANOVA was used to gain a major media gap (SPSS17).

RESULTS

Total carbohydrate, protein and lipid values are provided in Table 1 and Figure 2 of the control and experimental tissue of *anabas testudineus*. In experimental *Anabas testudineus*, the order of carbohydrate-changing percentages was found in the tissues of the liver > kidney > muscle > intestine > gill. The overall protein content of the tissues of the control fish was in the muscle > gill > liver > intestine > kidney. The variance in distribution indicates that under the influence of aquatic toxins the difference in metabolic size of different tissues has decreased steadily, and the overall tissue quality of the experimental fish has decreased. The muscle and gill showed a maximum decrease, and the kidney and intestine modest decrease. The decline of total protein content was percentage in the muscle > gill > kidney > liver > intestine in the pollutant-affected *Anabas testudineus*. A reduction in tissue lipid content was observed in the order of the gut > liver > kids > musculoskeletal > gill whereas the shift in lipid content in the order of gill > liver, > kidney > intestine, > musculoskeletal.

Table 1: The effect of water poisoning in various tissues of *Anabas Testudineus* on biochemical parameters

Tissue	Control fish	Experimental fish
Total Carbohydrate Content		
Gill	22.90 ±0.30	17.29 ±0.29 (24.50%)*
Muscle	30.83 ±0.52	21.43 ±0.27 (30.48%)*
Liver	39.81 ±0.54	24.35 ±0.42 (38.28%)*
Intestine	28.56 ±0.02	20.45 ±0.04 (28.39%)*
Kidney	16.98 ±0.34	11.27 ±0.39 (33.63%)*
Total Protein Content		
Gill	28.67 ±0.82	21.20 ±0.36 (26.10%)
Muscle	29.90 ±0.31	19.25 ±0.31 (35.62%)*
Liver	28.23 ±0.46	22.76 ±0.26 (19.40%)*
Intestine	24.47 ±0.05	20.32 ±0.01 (16.95%)
Kidney	19.37 ±0.44	14.65 ±0.34 (24.37%)*
Total Lipid Content		
Gill	10.88 ±0.21	9.09 ±0.34 (16.45%)*
Muscle	11.91 ±0.18	10.64 ±0.37 (10.66%)
Liver	17.59 ±0.45	14.81 ±0.22 (15.80%)*
Intestine	25.15 ±0.06	22.05 ±0.35 (13.71%)
Kidney	15.05 ±0.28	12.84 ±0.27 (14.68%)*

Values expressed as mg / g of wet tissue weights; every mean ± standard error value of five individuals; parenthesis values denote per cent change;

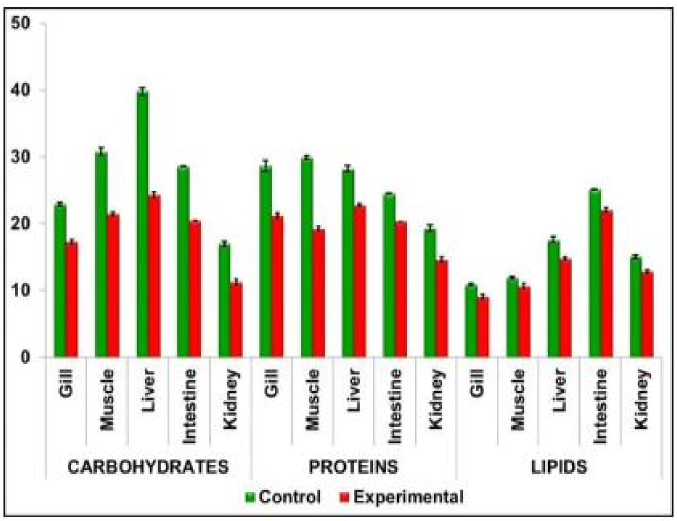

Fig 1: Effect of aquatic toxicants on Anabas testudineus' biochemical parameters. Calculated as mg / g wet tissue weight.

DISCUSSION

Carbohydrates are the leading sources of strength for any organism[10] and are present on large quantities of the skin , muscle and kidney and heart. carbohydrates are a major source of energy. The decrease in the amount of carbohydrates in the brain and muscles can be caused by glucose use to fulfil excess energy demand placed by significant mercury-toxic anaerobic stress. There was a drop in Clariasbatrachus' hepatic, muscle and kidney tissue glucose content when sodium arsenite exposed [11]. The effect on liver, muscle, and gill tissues of Mystusvitatus, when exposed to Sumidon, has also been stated to be changing by Neethirajan and Madhavan[12]. Agarwal[13] noted that Channa punctatus blood glucose was decreasing in mercuric chloride.Srivastav et al. [14] examined the effect of Heteropneustesfossilis on aldrine and carbamate and found a pronounced decrease in blood glucose levels, along with hyperchloremia. The hypoglycemic condition can be caused by increased muscle activity in fish, which needs more oxygen to fulfil energy requirements and thus a more readily used amount of glucose. The fish possibly try to do that by increasing the breathing rate, by obtaining more oxygen from contaminated water, which may be why a low level of blood glucose in infected fish is found.

In the liver , muscle and gills of Labeorohita in the chromum stressed state, Vutukuru[14] reported a substantial decrease in various biochemical components of (glycogen, total lipid, and total protein) compared to control peaches. Labeorohita may have a decrease in the glycogen content due to its enhanced use as an immediate source for metal stress energy demands. The prevalence of hypoxic or anoxic conditions may also be attributed to, which usually increases the use of glycogen[16]. The decrease in the amount of glycogen shows that the respective tissue uses lipids as a result of pollutant stress during the research. The findings were identical to those of ChannaPuntatus[17], chromium-exposed Sarotherodonmossambicus[18] and nickel-exposed Puntius conchonius[19].Bengeriet al.[21] were present in the parahydrological observation of Anabas Testudineus at the Channa punctatus exposed to blanched kraft pulp mill effluents, Murty and Devi[20] and LabeoRohita. Typically, metal poisoning leads to the depletion of glycogen because metabolism of carbohydrates is generalised. Hypoxia of the tissue and changes in the mechanism of buffering often lead to depletion of glycogen in the tissues[22]. The glycogen depletion mechanism may be the product of glycogenolysis and glycogenesis inhibition due to stress-inducing catecholamine release[23]. The glucose level of the Anabas testudineus from Buckingham canal in this study was significantly reduced in pollution.The usage, by extremely active fish tissues, of glucose by the beta cells of the islet of Langerhans, as well as the inhibiting D cells of the pancreatic islet of Langerhans, was similarly due to the substantial decrease in blood glucose at 8 ppm in Clarijabatrachus[24]. In this research, the amount of total carbohydrates in aquatic toxicants decreased significantly and the findings were found in line mit previous studies.

Proteins require large physiological events and, as a diagnostic method to assess the physiological stages of organism, the measurement of protein content may be regarded. The protein content of fish Catlacatla as a consequence of mercuric chloride toxicity was depreciated in muscles, intestines, and brains[26]. Sub lethal concentration of Cypermethrin, freshwater fish, Cyprinus carpio have demonstrated substantial alterations in protein fractions of liver , brain and muscle [27]. Similar findings have been found in copper, lead nitrate and mercuric chloride exposed Anabas testudineus and Anabas scandens[28].De Smet and Blust[29] reported that proteolysis aims to increase protein function during cadmium stress in energy production. A decrease in the sensitivity of tannery effluents to the overall liver protein of Channa punctatus was observed [30]. Many references to a decrease in blood protein in Oreochromis mossambicus[31] and heavy metals for Pernaviridis[32] are available in the administration in sublethal agrofan.

The most basic and abundant biochemical components in fish are proteins. During chronic stress cycles, proteins are the greatest energy source to spare. Animals which are exposed to toxicants at sublethal levels, including in the detoxification of the toxicant, undergo high stress at metabolic level. Namrata et al. [33] observed protein depletion under kelthane contact, organo chlorine insecticide and Channa punctatus starvation. Protein degradation was observed under the stress of various metals in traces in different tissues and organs of experimenting animals. After fish were exposed to heavy metals[34], a substantial decrease in the amount of Channa punctatus protein was noted. Jha and Jha have been shown to deplete protein in Anabas testudineus 's liver and gonads under the stress of nickel chloride.The present observation on total protein and free amino acid concentrations is consistent with Jha. In this analysis, the decrease in the total protein contents was further comparable to Gupta and Sastry's findings on Heteropneustesfossilis, Ramos and Herrera's exposure of mercuric chloride to pesticide-exposed fish. During this study the decreased amount of protein was indicative of increased proteolysis leading to a change in the metabolism of nitrogen. Another potential explanation for protein depletion is to inhibit ribosomal activity which leads to protein degradation. [34, 36, 37, 38]. [22].

Lipids are a major cellular structure variable. Lipids are also important to preserve normal cell permeability and cell membranes structural integrity. The reduction in lipid content in Labeorohita's liver and muscle tissues was found to be caused by synthetic pyrethroid and cypermethrin. In the Gambusia affinis muscle, liver and brain exposed to a pesticide, phosphamidon, Govindan et al.[41] recorded a substantial declin in overall lipid levels. The effect of the metal present in the Buckingham canal effluent on lipid as a tissue of the species has been recorded by a decrease in the total content of lipid in a gill, muscle, liver, intestine, and kidney tissue studied. The results for Channa punctatus poisoned with mercuric chloride and Jha[35] on Channa punctatus under plastic exposure in Ram and Sathyanesan[41] are supportive of this research.Lipid loss can result from lipid synthesis inhibition and lipid mobilisation [30, 42]. The decline in lipids and proteins may be due in part to the production of lipoproteins that are major cell constituents of cell membranes and cell organelles present in cytoplasms, and to their cell repair and tissue organization[43]. Declining lipid levels in pollution-affected Buckingham canal Anabas Testudineus can also be due to its use in cell repair and cell organelles. The depletion of Channa punctatus and Oreochromis mossambicus tissue proteins from Arakkonam Lake is possible as a result of impaired or zero protein syntheses and the use of them in macroprotein formation, which is removed by the fish as mucus to direct or indirect use of protein and lipids for the purpose of energy requirements was also reported [44, 45].

The growth and energy metabolism are typically driven by carbohydrates , proteins and lipids, which are the main components of the body. In Labeorohita, the effect of heavy metal plum was observed in the reduction of carbohydrates , proteins and lipids. A serious reduction in the content of carbohydrate , protein and lipid in fish population was recorded in the effluent of teal, tannery and distillery. It was observed that in various experimental groups and different days of exposure, total sugar and protein in muscle , liver, brain and kidney were seen a mixed pattern in CatlaCatla. The findings of this study indicate that different biochemical components of fish under pollution stress are significantly deteriorating. Fish are susceptible to water contaminations and pollutants which, when they reach the organs of those animals, can significantly harm certain physiological and biochemical processes.Several cases of changes in the pH , temperature, hardness and dissolved oxygen content of the water have been recorded where the toxic effects of contaminants may have been changed. The negative implications of the contaminants in particular hinder the development and adverse impact on the metabolism of the survivor. The glycogen, total protein and total lipid profiles were substantially reduced in tissue by the pollution-impacted fish in the biochemical profiles. In the current research, metabolic levels were found to be organ-specific, suggesting differential tissue sensitivity to the toxicants. In addition , changes under metallic stress in an organism have been difficult to understand because such changes vary not only from metal, from species to species, but from experimental period to experimental period.Nair et al. have found significant changes in these factor when fish were exposed to titanium dioxide effluent during their study of the biochemistry and haematology of Anabas testudineus Glycogen, according to them, is the first metabolite that is influenced by any stress, as the chief energy source for fish. It was also noted that increased liver glycogen indicates simultaneous stimulation of glycogen synthesis with increased liver glucose glycogenolysis. A standard stress reaction was indicated with a dose dependent hyperglycemic state.This may be caused by general stress or by hypoxic conditions caused by purely mechanical and/or heavy metal activity on the working of the gill. Generally speaking, more energy is required to cope with stress. This energy can be derived as carbohydrates , proteins and/or lipids from organic substances. Thus fish attempt to detoxify the toxicant during toxicity exposure by eating more energy and therefore reducing glycogen, protein and lipid content[46-50].

A significant dysfunction has been observed in Anabas testudineus' liver and muscle tissue exposed to water contaminants. There was also major glycogen, protein and lipid depletion. The loss of metabolites revealed that under the toxic stress all of a fish's metabolic pool is disrupted. In addition , changes to the biochemical profile suggest their quick use in order for cellular biochemical processes to provide excess energy to cope with stress. The findings of this study also indicate that aquatic pollution is among the key causes of decline in the population of Anabas testudineus and most likely of the others residents of freshwater fish.

CONCLUSION

This research will aid in assessing these three fish's health status. Protein and lipid estimates would definitely identify early clinical symptoms in relation to their environments.

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