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BIOCHEMICAL EXAMINATION OF CESTODE PARASITE IN FRESH WATER FISH *MASTACEMBELUS ARMATUS* FORM OSMANABAD DISTRICT (M.S.) INDIA

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ABSTRACT

The present study focuses on the biochemical examination of cestode parasites infecting the freshwater fish *Mastacembelus armatus* from the Osmanabad district of Maharashtra, India. With the growing importance of parasitic biochemistry in understanding host-parasite interactions, this research investigates variations in key biomolecules proteins, glycogen, and lipids in both the parasite and the intestinal tissues of infected and non-infected hosts. The findings reveal that the cestode parasite i.e. *Senga* sp. exhibits lower concentrations of proteins and glycogen compared to the intestines of both infected and non-infected hosts. Conversely, lipid levels are found to be higher in the parasite than in the host tissues. Additionally, the biochemical components are consistently higher in non-infected intestinal tissues compared to infected ones. These results highlight the metabolic dependence of the parasite on its host and provide insight into the physiological alterations associated with parasitic infection in freshwater fishes.

Keywords: Biochemical examination, Cestode parasite, *Mastacembelus armatus*, Osmanabad district, *Senga* sp.

INTRODUCTION

Fish are often referred to as “gold in the water” because of their immense economic value and their vital contribution as a source of high-quality protein for the growing global population. They play an important role in human nutrition and the economy, particularly in developing countries where fish are a staple source of animal protein. However, fish populations are frequently affected by parasitic infections that can lead to reduced growth, poor health, and economic losses in aquaculture (Sharma et al., 2012). Among these parasites, cestodes (tapeworms) are of significant concern due to their pathogenicity and ability to cause physiological and biochemical alterations in their hosts.

Cestodes inhabit the alimentary tracts of vertebrates and derive their nutrition directly from the host’s intestinal contents. Because they lack a complete digestive system, these parasites rely primarily on absorption through the tegument for survival. Glucose serves as a crucial source of energy for cestodes, playing an essential role in their metabolic processes (Mishra et al., 1991). Earlier biochemical studies have revealed that cestodes possess substantial reserves of carbohydrates and are efficient in metabolizing them. These stored carbohydrates are mainly in the form of glycogen, which acts as the primary energy reserve (Read, 1949b; Daugherty, 1956; Fairbairn et al., 1961).

Proteins are essential biomolecules involved in numerous biological processes and are ubiquitously present in living organisms. Although proteins perform a wide range of functions, a universally accepted system for their classification has yet to be established. Among various types, enzymes constitute one of the largest groups and serve as an important nutritional component for cestodes (tapeworms). These parasites utilize proteins in varying amounts to meet their energy requirements. Previous research indicates that cestodes can successfully adapt to a parasitic mode of life only when proteins—comprising approximately 20-40% of their dry weight are available in sufficient quantities (Barrett, 1981). Furthermore, it has been reported that lipid concentrations tend to increase in the older proglottids, or body segments, of tapeworms (Brand & Van T., 1952).

The glycogen content of helminths varies considerably depending on their habitat and metabolic requirements. In cestodes, which inhabit the alimentary canals of vertebrates, glucose serves as a vital energy source (Mishra et al., 1945). These parasites possess a remarkable ability to store and metabolize carbohydrates efficiently. Several studies have demonstrated that cestodes contain substantial reserves of carbohydrates (Daugherty, 1956; Fairbairn et al., 1961; Markov, 1943; Read & Rothman, 1957b), which are predominantly stored in the form of glycogen (Read, 1949; Reid, 1942).

Lipids serve as the principal form of concentrated energy storage in cestodes and play a vital role in maintaining cellular structure and supporting numerous biochemical processes. They contribute significantly to the parasite's metabolism and overall physiological functions. Previous studies have reported that the lipid content increases in older proglottids, the segmented regions of tapeworms (Brand & Van T., 1952).

Biochemical investigations of parasites are of great importance because they provide insight into host–parasite interactions, metabolic adaptations, and energy utilization. Comparative biochemical analyses between parasites and their host tissues can reveal how parasites modify host metabolism to meet their nutritional demands (Fairbairn et al., 1961; Barrett, 1981). Such studies contribute to understanding the physiology and pathology of parasitic infections and may assist in developing management strategies for parasitic control in fish populations.

Considering these aspects, the present study aims to carry out a biochemical examination of *Senga* sp., a cestode parasite infecting the freshwater fish *Mastacembelus armatus* from the Osmanabad district of Maharashtra, India. The investigation focuses on estimating the concentrations of proteins, glycogen, and lipids in the parasite and comparing them with those in the intestines of infected and non-infected hosts to evaluate the biochemical impact of parasitic infection.

MATERIAL AND METHODS

Sample collection- The cestode parasites were isolated from the intestines of the freshwater fish *Mastacembelus armatus* and thoroughly rinsed with distilled water to remove any adhering debris. Following the wash, the specimens were gently blotted on filter paper to eliminate excess moisture. The cleaned worms were then placed in a watch glass and weighed using an analytical balance for accurate measurement. Subsequently, the samples were dried in a hot air oven at a temperature range of 50-60°C for 24 hours, and their dry weight was recorded for further biochemical analysis.

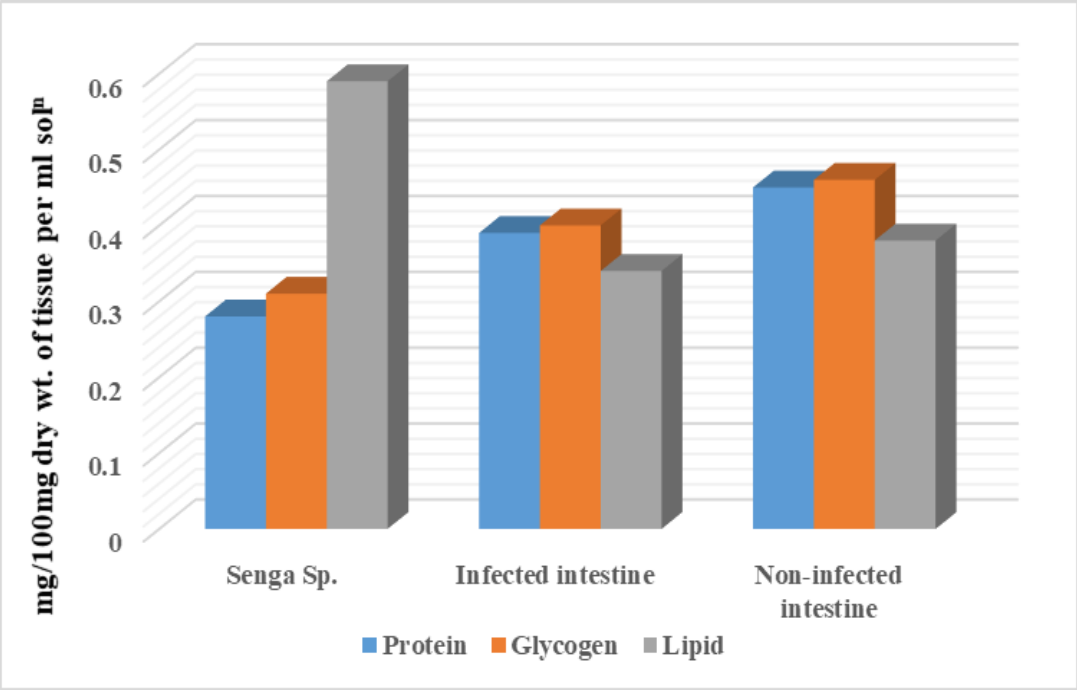
Biochemical estimation- The estimation of biochemical components in the cestode parasites was carried out using standard protocols. The total protein concentration was determined following the method of Lowry et al. (1951). Glycogen estimation was performed according to the procedure described by Kemp et al. (1954), while the lipid content was analysed using the method proposed by Folch et al. (1957).

RESULT AND DISCUSSION

Table No. 1:- Biochemical estimation of *Senga* Sp. species from Fresh water fish *Mastacembalus armatus* from the Osmanabad district (M.S.) India.

Name of Parameter	***Senga* Sp.**	**Host intestine**	
		Infected	**Non-infected**
Protein (mg/100mg dry wt. of tissue per ml sol^{n})	0.28 ±0.025	0.39±0.041	0.45±0.016
Glycogen (mg/100mg dry wt. of tissue per ml sol^{n})	0.31±0.033	0.40±0.022	0.46±0.014
Lipid (mg/100mg dry wt. of tissue per ml sol^{n})	0.59±0.033	0.34±0.022	0.38±0.028

Graph No. 1:- Biochemical estimation of *Senga* Sp. species from Fresh water fish *Mastacembalus armatus* from the Osmanabad district (M.S.) India.



The biochemical evaluation of *Senga* sp. and the host intestines (infected and non-infected) revealed significant differences in the levels of proteins, glycogen, and lipids. The results indicate that *Senga* sp. exhibits lower concentrations of protein and glycogen compared to the host tissues, while its lipid content is comparatively higher.

The protein concentration in *Senga* sp. was found to be 0.28 ± 0.025 mg/100 mg dry weight of tissue per ml solution, which is notably lower than that of the infected (0.39 ± 0.041 mg/100 mg) and non-infected (0.45 ± 0.016 mg/100 mg) host intestines. This reduction in protein level may be attributed to the parasitic mode of life, where the cestode utilizes pre-digested nutrients from the host's intestine, thereby minimizing the need for its own protein synthesis.

Similarly, glycogen content was observed to be 0.31 ± 0.033 mg/100 mg in *Senga* sp., while the infected and non-infected host intestines contained 0.40 ± 0.022 mg/100 mg and 0.46 ± 0.014 mg/100 mg, respectively. The lower glycogen level in the parasite indicates its limited capacity for carbohydrate storage and dependency on the host for an immediate supply of energy-rich metabolites.

In contrast, the lipid concentration in *Senga* sp. was found to be 0.59 ± 0.033 mg/100 mg, which was significantly higher than that in the infected (0.34 ± 0.022 mg/100 mg) and non-infected (0.38 ± 0.028 mg/100 mg) host intestines. This increased lipid content suggests that lipids play a crucial role in the parasite's metabolism, possibly serving as a major energy reserve and contributing to its survival and reproductive functions within the host environment.

Overall, the findings suggest that *Senga* sp. exhibits a biochemical adaptation suited to its parasitic existence. The reduced protein and glycogen levels, coupled with elevated lipid reserves, reflect the parasite's dependence on the host for readily available nutrients and its energy-efficient strategy for survival. These results are in agreement with previous studies on cestode parasites, which have reported similar biochemical patterns associated with parasitic adaptation and nutrient absorption mechanisms.

CONCLUSION

The present study highlights distinct biochemical variations between *Senga* sp. and the host intestines (infected and non-infected). The parasite showed significantly lower levels of protein and glycogen, while lipid content was considerably higher compared to the host tissues. These differences indicate that *Senga* sp. relies heavily on the host for nutrient acquisition, particularly for proteins and carbohydrates, and stores more lipids as an adaptive strategy for energy conservation and survival within the host environment. Overall, the results suggest that biochemical composition plays an essential role in the parasite's adaptation, metabolism, and successful establishment in the host intestine.

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