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STUDIES ON BIOCHEMICAL COMPOSITION OF *LABEO ROHITA* FROM MAHARASHTRA: A REVIEW

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ABSTRACT

Labeo rohita (Rohu) is one of the most important Indian major carp species widely cultured in freshwater ecosystems of Maharashtra, including Nanded district and other parts of the Marathwada region. The species contributes significantly to inland fisheries and aquaculture production due to its high consumer preference, rapid growth, and nutritional value. The biochemical composition of fish serves as an important indicator of physiological condition, nutritional quality, growth performance, and environmental adaptation. The present review summarizes available information on the biochemical composition of *Labeo rohita* with special reference to aquaculture systems of Maharashtra. Published studies indicate that Rohu muscle contains high moisture content (76–80%), crude protein (16–20%), low to moderate lipid content (0.5–4.0%), and ash content ranging from 1–3%. The species is also rich in essential amino acids, polyunsaturated fatty acids, and important minerals such as calcium, phosphorus, potassium, magnesium, iron, and zinc. Variations in biochemical constituents are influenced by season, age, feeding regime, water quality, reproductive status, and culture practices. In the Marathwada region, including Nanded, Rohu is commonly cultured in reservoirs, farm ponds, and irrigation tanks where environmental conditions may influence its biochemical profile. Understanding these biochemical characteristics is important for fish quality assessment, nutritional evaluation, and sustainable aquaculture development in Nanded and other regions of Maharashtra.

Keywords: *Labeo rohita,* Rohu, biochemical composition, proximate composition, amino acids, fatty acids, minerals, Nanded, Marathwada, Maharashtra.

INTRODUCTION

Fish muscle is composed of several biochemical constituents that influence its quality, physiology, and metabolic activities. Among Indian major carps, *Labeo rohita* (Rohu) is one of the most commercially important freshwater species cultured in Maharashtra, particularly in districts such as Nanded, Parbhani, Hingoli, Latur, Beed, Osmanabad, Jalna, and Aurangabad of the Marathwada region, Rohu is extensively reared in ponds, reservoirs, irrigation tanks, and polyculture systems The biochemical composition of fish reflects the interaction between genetic factors and environmental conditions such as water quality, food availability, season, and culture practices (Shekhar, 2004).

Biochemical analysis of fish generally includes determination of moisture, crude protein, crude lipid, ash content, amino acid composition, fatty acid profile, and mineral concentration. These components are widely used as indicators of fish health, growth status, and flesh quality (Paul et al., 2018). Rohu exhibits considerable variation in biochemical composition depending on habitat and physiological condition (Hadyait et al., 2018). Therefore, a review of its biochemical characteristics is important for understanding the species' biological and aquaculture significance.

Nanded district possesses considerable freshwater resources including the Godavari River, Vishnupuri Reservoir, Siddheshwar Reservoir, and numerous aquaculture ponds that support carp farming. Similarly, several reservoirs and irrigation projects across Marathwada provide suitable habitats for Rohu culture. Studies conducted on freshwater fishes from Maharashtra have indicated that environmental conditions such as temperature, dissolved oxygen, nutrient availability, and feeding practices can influence biochemical composition. Since Rohu is a major component of freshwater aquaculture production in the region, understanding its biochemical composition is essential for evaluating fish health, nutritional value, and aquaculture performance. Therefore, this review aims to summarize available information on the biochemical composition of *Labeo rohita* with emphasis on its relevance to Nanded, Marathwada, and Maharashtra aquaculture systems.

MATERIALS AND METHODS

The present review was prepared using information collected from published research papers, fisheries journals, aquaculture reports, and scientific databases related to the biochemical composition of *Labeo rohita*. Literature concerning proximate composition, amino acid profile, fatty acid composition, and mineral content was critically reviewed and summarized. Data from studies conducted in India, including findings relevant to Maharashtra aquaculture systems, were compiled to provide an overview of the biochemical constituents of Rohu. Available reports on fish culture practices and fisheries resources of Nanded district were also considered to understand regional influences on fish quality.

RESULTS

1. Moisture Content

Moisture is the major component of fish muscle and generally constitutes the largest proportion of Rohu flesh. Studies have reported moisture levels ranging between 76% and 80% (Shekhar, 2004; Paul et al., 2018). Variations in moisture content are often associated with age, feeding intensity, reproductive cycle, and environmental conditions. An inverse relationship between moisture and lipid content is commonly observed (Hadyait et al., 2018).

2. Protein Content

Protein is the principal organic constituent of Rohu muscle. The crude protein content generally ranges from 16% to 20% (Paul et al., 2018; Hadyait et al., 2018). Muscle proteins consist mainly of myofibrillar proteins, sarcoplasmic proteins, and connective tissue proteins. Seasonal fluctuations in protein levels have been observed, with higher values frequently recorded during active feeding periods (Shekhar, 2004).

3. Lipid Content

The lipid content of *Labeo rohita* is relatively low compared to many marine fishes. Reported lipid concentrations range from 0.5% to 4.0% (Dayami and Sarojnalini, 2019; Hadyait et al., 2018). Lipids serve as energy reserves and play important roles in cell membrane structure and physiological functions. Variations in lipid content are influenced by season, maturity stage, and nutritional status (Shekhar, 2004).

4. Ash Content

Ash content represents the total inorganic mineral residue remaining after combustion. In Rohu, ash content generally ranges from 1% to 3% (Paul et al., 2018). Ash values provide an estimate of the total mineral composition of fish tissue and are influenced by habitat and feeding conditions.

5. Amino Acid Composition

The protein fraction of Rohu contains both essential and non-essential amino acids. Major essential amino acids reported include lysine, leucine, isoleucine, methionine, threonine, valine, phenylalanine, and histidine (Mohanty et al., 2014). Among these, lysine and leucine are often found in comparatively higher concentrations. Non-essential amino acids such as glutamic acid, aspartic acid, glycine, alanine, and serine are also abundant (Mohanty et al., 2014).

6. Fatty Acid Profile

The lipid fraction of Rohu contains saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and polyunsaturated fatty acids (PUFA). Common fatty acids identified include palmitic acid, stearic acid, oleic acid, linoleic acid, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) (Dayami and Sarojnalini, 2019; Mohanty et al., 2014). The relative abundance of these fatty acids varies depending on diet and culture environment.

7. Mineral Composition

Biochemical analyses have revealed the presence of several macro- and micro-minerals in Rohu tissues. Major minerals include calcium, phosphorus, potassium, sodium, and magnesium (Paul et al., 2018). Trace elements such as iron, zinc, manganese, and copper are also present in smaller quantities (CIFT; FAO, 2022). Mineral composition may vary according to water quality and feeding practices.

DISCUSSION

The biochemical composition of *Labeo rohita* demonstrates characteristic features typical of freshwater carps. Moisture constitutes the largest fraction of muscle tissue, while protein forms the major organic component. Seasonal variations in moisture, protein, and lipid contents have been reported in several studies, suggesting that environmental factors significantly influence fish biochemistry (Shekhar, 2004; Hadyait et al., 2018).

The amino acid composition of Rohu reflects a balanced distribution of essential and non-essential amino acids, indicating efficient protein synthesis and metabolic activity (Mohanty et al., 2014). Similarly, the fatty acid profile contains a mixture of saturated, monounsaturated, and polyunsaturated fatty acids that contribute to membrane integrity and physiological functions (Dayami and Sarojnalini, 2019).

Mineral constituents form an important part of the biochemical profile and play critical roles in osmoregulation, enzyme activation, skeletal development, and metabolic regulation (Paul et al., 2018). Differences in mineral concentrations among studies may be attributed to variations in water chemistry, feed composition, and culture systems.

In Maharashtra, including Nanded district and the wider Marathwada region, Rohu is cultured under diverse environmental conditions, including ponds, reservoirs, and polyculture systems. Reservoirs such as Vishnupuri and Siddheshwar in Nanded district support fisheries activities and provide suitable environments for carp culture. Such variations may influence the biochemical characteristics of fish; however, the overall composition remains consistent with values reported for Indian major carps (Paul et al., 2018; FAO, 2022). Therefore, biochemical assessment remains a valuable tool for monitoring fish quality and evaluating aquaculture performance.

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