INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Paper

A Review on Biomedical and Pharmaceutical Activities of Rohu Fish

Nazil khan*, Sanath rahangdale, Shweta Nawghare, Dr. V.S Babu Agala

G.H Raisoni Institute Of Life Sciences.

ARTICLE INFO

Published: 11 Apr 2026
Keywords:
Biomedical, Pharmaceutical Activities, Rohu Fish, Labeo rohita
DOI:
10.5281/zenodo.19511330

ABSTRACT

Labeo rohita, a freshwater fish widely distributed across South Asia, has gained attention in pharmaceutical and biomedical fields because of its potential therapeutic properties. This review explores the bioactive compounds and pharmacological activities associated with Labeo rohita, including its antimicrobial, antioxidant, anti-inflammatory, and anti-cancer properties. Fish is rich in essential fatty acids, amino acids, and minerals, making it a valuable source of nutrition with beneficial health effects. Several studies have highlighted the potential of Labeo rohita extracts in traditional medicine for treating various ailments, such as infections, inflammatory disorders, and oxidative stress-related diseases. Furthermore, fish biomedical applications, such as drug delivery systems and tissue engineering, have shown promise. This review also examines the underlying molecular mechanisms responsible for these pharmacological effects, including the modulation of signaling pathways and the role of bioactive compounds. Despite the growing body of research, further studies are needed to fully elucidate the therapeutic potential of Labeo rohita and translate its biomedical applications into clinical settings.

INTRODUCTION

Fish are recognized as a valuable source of protein with lower cholesterol levels, making them a recommended dietary choice. The primary components of fish include moisture, protein, fat, minerals, and certain vitamins. While the carbohydrate content in fish is typically minimal, the moisture content ranges from 60% to 80%. Fish provide a substantial protein content of 15% to 16%, with fat content generally ranging from 2% to 13%. The nutrient composition of fish varies based on species, size, age, and seasonal factors, which are significant determinants. Historically, fish have been acknowledged as an excellent source of animal protein. They are widely consumed globally due to their high protein and low saturated fat content. Additionally, fish are a rich source of omega-3 polyunsaturated fatty acids, which are beneficial for reducing the risk of heart disease in adults, crucial for neural

***Corresponding Author:** Nazil Khan
Address: *G.H Raisoni Institute Of Life Sciences.*
Email ✉: nazzkhan0135@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

development in infants and young children, and supportive of overall health[1].

Labeo rohita is a popular Indian major carp species used in carp polyculture practices. It is a water column feeder that feeds on plankton. . It is a freshwater fish, particularly in India, Bangladesh, Nepal, and Pakistan. It contributes significantly to food security, nutrition, and the economy of South Asia. In India, it has been introduced into almost all riverine systems and now occupies a central position in the polyculture of fish in ponds. Its compatibility for resource utilization with other freshwater carps, mainly catla (Catla catla) and mrigal (Cirrhinus mrigala), makes it an ideal candidate for carp polyculture practice. High growth potential and compatibility, coupled with high consumer preference, have established rohu as one of the most popular and delicious freshwater fish cultured in India, Bangladesh, and other adjacent countries in the region. It serves as an important nutritional source of protein and n-3 PUFA . Among all IMCs, rohu supplied the highest percentage of protein. In small fractions, it also acts as a source of calcium and vitamin A. Nutritionally, rohu is an excellent source of high-quality proteins, essential amino acids, omega-3 fatty acids, vitamins, and minerals such as calcium, phosphorus, and iron. Beyond its dietary importance, rohu fish is increasingly recognized for its biomedical and pharmaceutical potential. Bioactive compounds derived from the skin, scales, and swim bladder of this fish include collagen, gelatin, and peptides with antioxidant, antimicrobial, and wound-healing properties. Additionally, rohu fish oil, which is rich in polyunsaturated fatty acids, plays a crucial role in cardiovascular health, brain function, and anti-inflammatory activity. With the rising global interest in natural biomaterials and sustainable drug delivery systems, rohu-derived products are being explored for nutraceuticals, wound dressings, and transdermal drug delivery patches. The dual significance of rohu as both a staple food and a reservoir of therapeutic compounds makes it an important subject of study in aquaculture, nutrition and biomedical sciences. In the juvenile and adult stages, rohu is essentially an herbivorous column feeder. [2]

Physical characteristics :-

- Rohu has a thick body with narrow head and tail compared to catla and the weight of the head is less in rohu when compared with catla
- The body is covered with scales, except for the fins and head. In addition, the head was triangulated.
- Body surface and under body surface of rohu is brown in colour.
- The belly is silver-coloured and there are a total of 7 fins in the body.
- The maximum length is generally 1 meter.
- The scales are reddish in colour except the belly part[1] .

Biomedical activities:

Labeo rohita is a valuable source of high-quality proteins, containing essential amino acids necessary for growth, tissue repair, and metabolic functions. The enzymatic hydrolysis of these proteins yields bioactive peptides with antioxidant, antimicrobial, and anti-inflammatory properties. These peptides effectively neutralize free radicals, thereby mitigating oxidative stress and reducing the risk of chronic diseases. Additionally, the fish is abundant in polyunsaturated fatty acids, particularly omega-3 and omega-6 fatty acids, which contribute to cardioprotective and anti-inflammatory effects. Regular consumption of Labeo rohita aids in lowering serum cholesterol levels, enhancing lipid metabolism, and supporting cardiovascular health. The skin mucus of Labeo rohita exhibits antimicrobial activity, containing natural antimicrobial peptides that

protect against pathogenic microorganisms. These compounds have demonstrated inhibitory effects against various gram-positive and gram-negative bacteria, underscoring their potential application in pharmaceutical and therapeutic contexts. Another significant biomedical property is its wound healing potential. Collagen extracted from the skin and scales of Labeo rohita promotes cell proliferation, tissue regeneration, and expedited wound closure. Due to its biocompatibility, this collagen is being investigated for use in biomedical dressings, tissue scaffolds, and regenerative medicine. Furthermore, Labeo rohita contributes to bone health, as its scales and bones are rich in calcium and hydroxyapatite.

Bioactive and Nutritional Components :-

Proteins and Bioactive Peptides

Rohu muscle, roe, and processing by-products are rich sources of high-quality proteins. Enzymatic hydrolysis of these proteins yields bioactive peptides with physiological activities such as antioxidant, angiotensin-converting enzyme (ACE) inhibitory, and antiproliferative effects.

Lipids and Polyunsaturated Fatty Acids

Rohu contains significant amounts of omega-3 polyunsaturated fatty acids (PUFAs), including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These fatty acids are associated with cardioprotective, anti-inflammatory, and neuroprotective effects, supporting the role of Rohu as a functional dietary fish[5] .

Biomedical Activities :-

Antioxidant Activity

Several studies have demonstrated that protein hydrolysates and peptides derived from L. rohita exhibit strong antioxidant activity by scavenging free radicals and reducing oxidative stress. These properties are attributed to specific amino acid sequences capable of donating protons and chelating metal ions (Saha & Guha, 2015). Antioxidant enzymes such as superoxide dismutase, catalase, and glutathione peroxidase in Rohu also play an important role in cellular defense mechanisms.

Antihypertensive (ACE-Inhibitory) Activity

Bioactive peptides obtained from Rohu roe, muscle, and swim bladder have been shown to inhibit angiotensin-converting enzyme (ACE), which is a key regulator of blood pressure. These peptides demonstrate stability against gastrointestinal digestion, suggesting their suitability for development as antihypertensive nutraceuticals or functional food ingredients.

Immunomodulatory Effects

Rohu exhibits a well-developed innate immune system, making it a useful model for immunological studies. Dietary supplementation studies show enhanced immune parameters such as phagocytic activity, lysozyme levels, and antioxidant enzyme expression. These findings suggest the presence of immunostimulatory compounds that could inspire biomedical research in immune regulation.

Antiproliferative and Anticancer Potential

Protein hydrolysates from Rohu roe have demonstrated antiproliferative activity against certain human cancer cell lines under in-vitro conditions. Although preliminary, these results indicate potential anticancer properties of Rohu-derived peptides that warrant further pharmacological and clinical investigation [5] .

Pharmaceutical activies :

Pharmaceutical and Nutraceutical Potential :-

Functional Foods and Nutraceuticals

Given its rich composition of bioactive peptides, omega-3 fatty acids, and antioxidants, Rohu is a promising candidate for functional food and nutraceutical development. Incorporation of Rohu-derived hydrolysates into food systems may provide health benefits such as blood pressure regulation and oxidative stress reduction.

Cardioprotective Activity

Rohu is rich in omega-3 polyunsaturated fatty acids (EPA and DHA), which are well known for their cardioprotective properties. These fatty acids help in lowering triglyceride levels, reducing inflammation, and preventing platelet aggregation, supporting their use in cardiovascular health supplements and pharmaceutical preparations.

Wound Healing and Biomedical Applications

Gelatin and collagen extracted from Rohu skin and scales have promising pharmaceutical applications in wound healing, tissue engineering, and drug delivery systems. These biomaterials exhibit biocompatibility, biodegradability, and low antigenicity, making them suitable for medical and pharmaceutical use.

Pharmaceutical Importance of Fish By-Products

The by-products of Rohu, including skin, scales, bones, and swim bladder, offer an economical source of bioactive compounds. These materials can be utilized to produce pharmaceutical-grade gelatin, bioactive peptides, and antioxidants, thereby contributing to sustainable drug development and waste valorization.[5]

Bioactive Protein Hydrolysates with Antioxidant and ACE-Inhibitory Activities Enzymatic hydrolysates prepared from Labeo rohita roe proteins exhibit significant antioxidant activity in vitro (for example, radical scavenging and reducing power), which plays an important role in protecting cells from oxidative stress. Such properties are valuable in functional foods and nutraceutical formulations. These hydrolysates also demonstrate angiotensin-converting enzyme (ACE) inhibitory activity, which is associated with antihypertensive effects (i.e., the potential to help lower blood pressure). Further studies indicate that sialo glycoprotein hydrolysates from Rohu roe can significantly reduce systolic and diastolic blood pressure in animal models (Wistar rats), confirming their antihypertensive potential and indicating their suitability for nutraceutical/functional food development.

Endogenous Antioxidant Enzyme Systems Labeo rohita naturally expresses several key antioxidant enzymes — including catalase, glutathione peroxidase, superoxide dismutase (SOD), and glutathione S-transferase — which provide protection against oxidative stress. These systems are part of the fish's innate defense and have been characterized for their activity and potential use as biomarkers or sources of recombinant antioxidant proteins.

Components Activity:- [www.google.com]

Components	Application	Mechanism
Bioactive peptides	Anti-Hypertensive drugs suppplements	ACE Inhiitors
Protein Hydrolysates	Anti-Oxidants supplements	Scavenge free radicals
Fish Oil	Cardiovascular supplements	Lowers Triglycerides,Anti-inflamatory
Minerals	Bone supplements	Support mineralization
Collagen	Wound healing,Tissue Engineering	Stimulates Fibroblasts

CONCLUSION:

Rohu fish (Labeo rohita) constitutes a valuable natural resource with considerable biomedical and pharmaceutical potential. The presence of nutritionally and therapeutically significant biomolecules underscores its utility not only as a dietary protein source but also as a functional and medicinal biomaterial. Collagen, gelatin, and bioactive peptides derived from Rohu fish present promising alternatives to mammalian sources due to their safety, cost-effectiveness, and reduced risk of disease transmission. Despite these promising findings, further research is necessary to standardize extraction methods, optimize formulation techniques, and assess long-term safety and clinical efficacy. Advanced in-vivo studies and clinical trials are essential to translate laboratory findings into commercial pharmaceutical and biomedical products. Overall, Rohu fish holds significant promise for future applications in drug delivery, regenerative medicine, nutraceuticals, and sustainable pharmaceutical development.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to my project guide MRS. Shweta Nawghare (Assistant Professor) and project head MRS. Anjali Gandhare ma'am and DEAN V.S Babu Agala sir, whose valuable guidance, support, and encouragement made this review article possible. I am also thankful to the faculty members of the Department of Pharmacy for providing the necessary resources and academic support throughout the preparation of this work. I extend my appreciation to my friends and classmates for their helpful suggestions and motivation, encouragement and support during the completion of this review article.

REFERENCES

1. Mahomoodally, Mohamad Fawzi, Dilmar Aniisah Sanaa, Gokhan Zengin, Monica Gallo, and Domenico Montesano. "Traditional therapeutic uses of marine animal parts and derived products as functional foods–a systematic review." *Food Reviews International* 39, no. 2 (2023): 827-857.
2. Majumder, Sandip, Neha Majumdar, Pinki Ghosh, Surjya Kumar Saikia, and Samar Kumar Saha. "Rohu Labeo rohita (Hamilton, 1822) changes feeding strategy throughout its ontogeny: an explanation from feeding ecology." *Int J Sci Res Biol Sci* 5 (2018): 92-96.
3. Ghosh, Nabanita, Saheli Ghosal, and D. K. Bhattacharyya. "Phytochemical Screening and Antioxidative Activity of Oil Extracted from Indian Carp Fish (Labeo Rohita) Skin." *Int. Res. J. Eng. Tech* 6, no. 2 (2019): 1414-1420.
4. Rai, A. K., N. Srivastava, A. K. Nigam, U. Kumari, S. Mittal, and A. K. Mittal. "Response of the chromatophores in relation to the healing of skin wounds in an Indian Major Carp, Labeo rohita (Hamilton)." *Tissue and Cell* 44, no. 3 (2012): 143-150.
5. Kanwate, Balaji Wamanrao, Sandesh Suresh Karkal, and Tanaji G. Kudre. "Impact of antioxidant potential of rohu (Labeo rohita) swim bladder gelatin hydrolysate on oxidative stability, textural and sensory properties of fish sausage enriched with polyunsaturated fatty acids." *Journal of Food Science and Technology* 61, no. 6 (2024): 1083-1093.
6. P. Deb, A.B. Deoghare, A. Borah, E. Barua, S. Das Lala, Mater. Today Proc. 5 (2018) 12909-12919.
7. C. P. Dhanalakshmi, Int. J. Phys. Sci. 7 (2012) 2093-2101.
8. W. Pon-On, P. Suntornsaratoon, N. Charoenphandhu, J. Thongbunchoo, N.

Krishnamra, I.M. Tang, Mater. Sci. Eng. C. 62 (2016) 183-189.
9. B.S. Kim, H.J. Kang, S.S. Yang, J. Lee, Biomed. Mater. 9 (2014).
10. N. Muhammad, Y. Gao, F. Iqbal, P. Ahmad, R. Ge, U. Nishan, A. Rahim, G. Gonfa, Z. Ullah, Sep. Purif. Technol. 161 (2016) 129-135.
11. W.F. Ho, H.C. Hsu, S.K. Hsu, C.W. Hung, S.C. Wu, Ceram. Int. 39 (2013) 6467-6473.
12. S.M. Asaduzzaman, Int. J. Complement. Altern. Med. 8 (2017).
13. M. Boutinguiza, J. Pou, R. Comesana, F. Lusquinos, A. De Carlos, B. Leon, Mater. Sci. Eng. C. 32 (2012) 478-486.
14. P. Deb, A.B. Deoghare, E. Barua, IOP Conf. Ser. Mater. Sci. Eng. 377 (2018).Destainville, E. Champion, E. Laborde, Synthesis, Mater. Chem. Phys. 80 (2003) 269-277.
15. A. Destainville, E. Champion, E. Laborde, Synthesis, Mater. Chem. Phys. 80 (2003) 269-277.
16. S. Kongsri, P.L.N. Ayuttaya, S. Yookhum, S. Techawongstein, S. Chanthai, Asian J. Chem. 25 (2013) 5847-5850.
17. F. Pati, B. Adhikari, S. Dhara, Bioresour. Technol. 101 (2010) 3737-3742.
18. S. Meejoo, W. Maneeprakorn, P. Winotai, Thermochim. Acta. 447 (2006) 115-120.
19. N.N. Panda, K. Pramanik, L.B. Sukla, Bioprocess Biosyst. Eng. 37 (2014) 433-440.
20. S. Mondal, A. Mondal, N. Mandal, B. Mondal, S.S. Mukhopadhyay, A. Dey, S. Singh, Bioprocess Biosyst. Eng. 37 (2014) 1233-1240.

HOW TO CITE: Nazil khan, Sanath rahangdale, Shweta Nawghare, Dr. V.S Babu Agala, A Review on Biomedical and Pharmaceutical Activities of Rohu Fish, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 4, 1862-1867 https://doi.org/10.5281/zenodo.19511330