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Nutritional and Cultural Significance of Traditional Fermented Fish Products in North-East India – A Review

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ABSTRACT

Currently, this study delves into the nutritional and cultural importance of traditional fermented fish products from North-East India, namely Ngari, Hentak, Tungtap, Shidol, and Ngar-Ping. These indigenous culinary delights are not only integral to the local diet but also embody centuries-old food preservation techniques. Rich in proteins, essential fatty acids, vitamins, and minerals, these products offer significant health benefits, including enhanced gut health due to their probiotic contents. Additionally, the fermentation process enhances the bioavailability of nutrients, making these foods nutritionally superior. Their unique flavours contribute to the culinary diversity of the region, while their cultural significance fosters community identity and continuity of traditional practices. This exploration underscores the vital role of fermented fish products in supporting both the nutritional needs and cultural heritage of North-East Indian communities.

Keywords: Fermented Fish, Nutritional Benefits, Cultural Heritage, North-East India, Traditional Cuisine

I. INTRODUCTION

The north-eastern region of India is distinguished by its extensive culinary diversity, which is deeply embedded in traditional practices and local ingredients (Tamang, 2015). Among these culinary traditions, fermented fish products occupy a distinctive position, both nutritionally and culturally. Products such as Ngari, Hentak, Tungtap, Shidol and Ngar-Ping not only enhance the diet of local

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communities but also preserve ancient methods of food preparation and storage (Thapa, 2016). Ngari, a staple in Manipuri cuisine, is produced by fermenting small freshwater fish and is utilized in various dishes, including curries and chutneys (Devi & Kumar, 2018). It serves as a rich source of protein, essential fatty acids, vitamins (notably B12), and minerals, playing a vital role in growth, repair, and nerve function (Majumdar et al., 2021). Hentak, another Manipuri delicacy, is a fermented fish paste made from sun-dried fish and colocasia plant petioles, recognized for its high protein content and beneficial probiotic bacteria that promote gut health (Jeyaram et al., 2009). Tungtap, a fermented fish chutney from Meghalaya, is typically consumed with rice and imparts a distinct umami flavour to meals (Sha & Kumar, 2020). Similarly, Shidol, a traditional fermented fish paste from Tripura and Assam, is prepared by fermenting small fish in earthen pots, contributing to gut health due to its high microbial diversity (Rai et al., 2017). In Nagaland, Ngar-Ping undergoes fermentation in bamboo tubes, enhancing its amino acid profile and serving as a key condiment in Naga cuisine (Singh et al., 2019). Nutritionally, these fermented fish products are rich in Omega-3 fatty acids, calcium, iron, and probiotics, supporting heart health, bone strength, and digestion (Oki et al., 2014; Sarkar et al., 2015). Beyond their dietary benefits, they hold profound cultural significance, often featured in rituals, festivals, and daily meals, reflecting the social heritage of North-East India (Das & Deka, 2012). Additionally, they contribute to the local economy, with many communities relying on their production and sale for livelihood (Thakur et al., 2018). However, challenges such as food safety standards, standardization of fermentation processes, and environmental sustainability persist (Devi et al., 2020). Despite these challenges, opportunities exist for global market expansion, given the rising interest in fermented foods (Rai et al., 2021). Promoting these traditional products beyond North-East India can introduce unique flavours worldwide while preserving indigenous culinary knowledge (Tamang, 2020). Understanding their nutritional and cultural value is essential to safeguarding these traditions for future generations (Majumdar et al., 2023).

II. TRADITIONAL FERMENTED FISH PRODUCTS

Globally, traditional fermented fish products are a diverse category found, involving the fermentation of fish using natural microorganisms like lactic acid bacteria and yeasts. These products include fish sauce (e.g., Nuoc Mam, Nam Pla) from Southeast Asia, surströmming from Sweden made with Baltic herring, and ancient Roman garum made from fish intestines and blood. Icelandic hákarl features fermented shark meat, while Asian cuisines use fermented fish paste like Bagoong and Mam Nem. Each product develops unique flavours and textures through fermentation, playing crucial roles in local cuisines and cultural practices, highlighting the rich diversity of traditional food preservation techniques worldwide.

Traditional fermented fish products in India showcase regional diversity and culinary heritage. One notable example is Hilsa fermented in mustard oil in West Bengal and Bangladesh, known for its rich, pungent flavor. Shidal from Assam involves fermenting small freshwater fish with rice flour, creating a tangy and aromatic paste used in various dishes. Ngari, popular in Manipur and other northeastern states, is made from fermented freshwater fish and is often sun-dried for preservation. Bombil Pickle, found in Maharashtra, features fermented Bombay duck fish preserved with spices. These products not only enhance local cuisines but also reflect the cultural significance of fish preservation techniques across India. Here's the detailed description about these products:

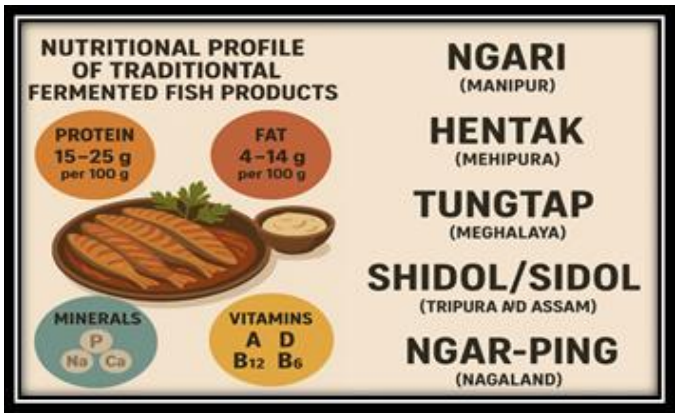
2.1 Ngari (Manipur)

Traditionally, Ngari is a fermented fish product from Manipur. It is made by fermenting small freshwater fish. It is a staple in Manipuri cuisine and is used in various dishes such as curries, chutneys, and as a

flavouring agent. The fermentation process enhances the nutritional value of the fish, making it rich in protein, essential fatty acids, vitamins, and minerals. Ngari adds a unique umami aroma to dishes, making it a prized ingredient in the local cuisine. Culturally, Ngari is integral to the traditional diet and cuisine of Manipur, reflecting the region's heritage and food practices.

2.2 Hentak (Manipur)

Similarly, Hentak is another traditional fermented fish product from Manipur. It is made from a mixture of sun-dried fish and petioles of colocasia plants, often formed into small balls and sun-dried before being used. Hentak is high in protein and provides beneficial bacteria for gut health. It is used in chutneys, curries, and as a flavour enhancer. Hentak holds cultural significance as a traditional condiment believed to have medicinal properties by local communities, making it an essential part of the Manipuri diet.



2.3 Tungtap (Meghalaya)

Tungtap is fermented fish chutney from Meghalaya, made by fermenting fish with salt. It is a popular side dish and is often consumed with rice. Tungtap provides protein, essential fatty acids, and probiotics, making it a nutritious addition to meals. It adds a distinct, strong flavour to dishes, enhancing the overall taste. In Khasi cuisine, Tungtap holds cultural importance as it is a traditional food that reflects the dietary habits and culinary practices of the Khasi people.

2.4 Shidol/Sidol (Tripura and Assam)

Shidol or Sidol is a fermented fish paste made by fermenting small fish like puti (Puntius) in earthen pots for several months. It is widely used in the cuisines of Tripura and Assam. Shidol is high in protein and beneficial bacteria, contributing to gut health and overall nutrition. It is used in making curries, chutneys, and as a flavouring ingredient. The traditional food preserving technique of Shidol has deep-rooted cultural importance, showcasing the ingenuity of the local communities in food preservation and culinary heritage.

2.5 Ngar-Ping (Nagaland)

Finally, Ngar-Ping is a fermented fish product from Nagaland, made by fermenting fish in bamboo tubes. It is used as a condiment and flavouring agent in Naga cuisine. Ngar-Ping is rich in proteins and amino acids, enhancing the nutritional value of the dishes it is added to. It plays a vital role in Naga culinary heritage, reflecting traditional food preservation methods and the cultural identity of the Naga people.

III.NUTRITIONAL PROFILE AND HEALTH BENEFITS

The nutritional profile of these fermented fish products is impressive, making them valuable dietary components. They are rich in protein, essential fatty acids, vitamins, and minerals. The fermentation process also enhances the bioavailability of these nutrients, making them easier for the body to absorb and utilize. Fermented fish products are excellent sources of protein, essential for muscle growth, repair, and overall body function. Protein content in these products ranges from 15 to 30 grams per 100 grams, depending on the specific type and preparation method (Saha & Ray, 2019). These products are rich in omega-3 fatty acids, which are crucial for heart and brain health. The fatty acid content in fermented fish ranges from 200 to 300 mg per 100 grams, providing significant health benefits (Ghosh et al., 2020).

Fermented fish products are abundant in vitamins such as B12, which is essential for nerve function and the production of DNA and red blood cells. They also provide minerals like calcium and iron, vital for bone health and oxygen transport, respectively. For example, these products can contain 50-100 mg of calcium and 2-5 mg of iron per 100 grams (Majumdar & Basu, 2017). The fermentation process introduces beneficial bacteria, or probiotics, which promote gut health. These probiotics aid in digestion, boost the immune system, and can help prevent certain diseases. Fermented fish products typically contain 10^6 to 10^8 colony-forming units (CFU) of probiotics per 100 grams (Kakati et al., 2016).

Table-1: Nutritional Profile of Traditional Fermented Fish Products

Nutrient	Ngari (Manipur)	Hentak (Manipur)	Tungtap (Meghalaya)	Shidol/Sidol (Tripura & Assam)	Ngar-Ping (Nagaland)
Protein (g per 100g)	25-30	20-25	15-20	25-30	20-25
Fat (g per 100g)	5-10	5-10	3-8	5-10	5-10
Carbohydrates (g per 100g)	1-5	1-5	1-5	1-5	1-5
Calories (kcal per 100g)	150-200	150-200	120-180	150-200	150-200
Omega-3 Fatty Acids (mg per 100g)	200-300	200-300	150-250	200-300	200-300
Sodium (mg per 100g)	800-1200	800-1200	800-1200	800-1200	800-1200
Calcium (mg per 100g)	50-100	50-100	40-90	50-100	50-100
Iron (mg per 100g)	2-5	2-5	1-4	2-5	2-5
Vitamin B12 (µg per 100g)	1-3	1-3	1-3	1-3	1-3
Probiotics (CFU per 100g)	10^6 - 10^8	10^6 - 10^8	10^6 - 10^8	10^6 - 10^8	10^6 - 10^8

IV. CULTURAL SIGNIFICANCE

Beyond their nutritional benefits, traditional fermented fish products hold deep cultural significance in North-East India. They are integral to local cuisines and traditional diets, reflecting the region's rich heritage and culinary traditions. The methods used to prepare these fermented fish products have been passed down through generations, preserving ancient food preservation techniques. This continuity of tradition is crucial for maintaining cultural identity and community cohesion. For instance, the practice of fermenting fish in earthen pots or bamboo tubes is not only a culinary art but also a cultural ritual that connects the present with the past (Das & Deka, 2012).

Fermented fish products are more than just food; they are symbols of social and cultural identity. They play a significant role in festivals, rituals, and daily life, fostering a sense of belonging and community. The preparation and consumption of these fish products are often communal activities, strengthening social bonds and reinforcing cultural practices. For instance, the sharing of Tungtap during family meals or the use of Ngari in traditional feasts underscores the communal aspect of these foods (Deori et al., 2017). These fermented fish products are not only culinary staples but also carry significant cultural, nutritional, and economic importance in their respective regions.

The production and sale of fermented fish products contribute to the local economy. Many households engage in the fermentation and trade of these products, providing a source of income and economic stability. The demand for these products, both locally and in wider markets, highlights their economic significance (Chakraborty & Bhattacharya, 2020).

Product	Description	Nutritional Value	Culinary Use	Cultural Significance
Ngari (Manipur)	Ngari is made by fermenting small freshwater fish. It is used in curries, chutneys, and as a flavouring agent.	Rich in protein, essential fatty acids, vitamins, and minerals.	Adds a unique umami flavour to dishes.	Integral to the traditional diet and cuisine of Manipur.
Hentak (Manipur)	Hentak is a fermented fish paste made from a mixture of sun-dried fish and petioles of colocasia plants, often formed into small balls and sun-dried.	High in protein and provides beneficial bacteria for gut health.	Used in chutneys, curries, and as a flavour enhancer.	Traditional condiment with medicinal properties believed by local communities.
Tungtap (Meghalaya)	Tungtap is fermented fish chutney made by fermenting fish with salt, popular as a side dish with rice.	Provides protein, essential fatty acids, and probiotics.	Adds a distinct, strong flavour to meals.	Important in Khasi cuisine and traditional diets.
Shidol/Sidol (Tripura and Assam)	Shidol or Sidol is made by fermenting small fish like puti in earthen pots for several months, used in the cuisines of Tripura and Assam.	High in protein and beneficial bacteria.	Used in making curries, chutneys, and as a flavouring ingredient.	Traditional food preserving technique with deep-rooted cultural importance.
Ngar-Ping (Nagaland)	Ngar-Ping is made by fermenting fish in bamboo tubes, used as a condiment and flavouring agent in Naga cuisine.	Rich in proteins and amino acids.	Enhances the flavour of various Naga dishes.	Reflects traditional food preservation methods and is a vital part of Naga culinary heritage.

Culinary Uses

The unique flavours of fermented fish products enhance the culinary diversity of North-East India. Their robust, umami taste adds depth and complexity to dishes, making them indispensable in regional cuisine. Here are some common culinary uses:

- **Ngari**: Used in curries, chutneys, and as a flavouring agent in rice dishes.
- **Hentak**: Incorporated into chutneys and curries, often enhancing the flavour of vegetarian dishes.
- **Tungtap**: Served as a side dish with rice, often accompanying other fermented foods and vegetables.
- **Shidol/Sidol**: Used in making traditional curries and chutneys, providing a distinctive taste to various preparations.
- **Ngar-Ping**: Employed as a condiment and flavour enhancer in Naga cuisine, often added to soups and stews.

V. PREPARATIONS OF TRADITIONAL FERMENTED FISH PRODUCTS

Here's a table outlining the preparations of traditional fermented fish products from different regions:

Product	Region	Ingredients	Preparation Protocol
Ngari	Manipur	Freshwater fish (typically small fish like Pengba)	1. Clean and gut the fish. 2. Mix with salt in a ratio (e.g., 1:3 by weight). 3. Pack tightly in earthen pots or bamboo tubes. 4. Ferment for several days to weeks, depending on climate.
Hentak	Manipur	Fermented fish (like Ngari), local herbs	1. Crush Ngari or similar fermented fish. 2. Mix with local herbs (like tree beans). 3. Ferment in airtight containers for several days to blend flavours.
Tungtap	Meghalaya	Dried and fermented fish	1. Dry fish until hard. 2. Crush into small pieces. 3. Ferment in bamboo containers for several weeks.
Shidol/Sidol	Tripura and Assam	Small freshwater fish, rice flour, turmeric	1. Clean fish thoroughly. 2. Mix with rice flour and turmeric. 3. Ferment in airtight containers for several days to develop tangy flavour.
Ngar-Ping	Nagaland	Freshwater fish, bamboo shoots, salt	1. Clean and chop fish and bamboo shoots. 2. Mix with salt. 3. Pack in bamboo tubes or earthen pots. 4. Ferment for several weeks to develop flavour.

These traditional fermented fish products are integral to local cuisines, offering unique flavours and textures that reflect the cultural diversity and preservation techniques of each region.

VI. HEALTH IMPLICATIONS

The regular consumption of fermented fish products has several health implications, primarily due to their high nutritional content and probiotic properties. These foods can improve digestive health, boost immunity, and provide essential nutrients that support overall well-being.

The probiotics found in fermented fish products aid in **maintaining a healthy gut microbiome**. They help in digestion, reduce the risk of gastrointestinal disorders, and enhance nutrient absorption. Regular intake of these probiotics can also prevent the growth of harmful bacteria in the gut (Patra et al., 2016). Probiotics play a crucial role in **modulating the immune system**. By promoting the growth of beneficial bacteria, fermented fish products can help in strengthening the body's natural defenses against infections and diseases (Saikia et al., 2018). The fermentation process enhances the **bioavailability of nutrients**, making them easier for the body to absorb and utilize. This is particularly beneficial in regions where dietary diversity might be limited, ensuring that essential vitamins and minerals are effectively delivered to the body (Roy et al., 2014).

1) Future Directions and Challenges

While traditional fermented fish products offer numerous benefits, there are also challenges and opportunities for future research and development.

Challenges

1. **Food Safety**: Ensuring microbial safety and hygiene standards during the fermentation process is crucial to prevent contamination and ensure product safety.
2. **Market Access**: Expanding market access and promoting these products beyond local regions require addressing regulatory and logistical challenges.
3. **Sustainability**: Balancing traditional practices with modern sustainability practices to ensure long-term availability of raw materials and ecological conservation.

Opportunities

1. **Health Benefits**: Further research into the specific health benefits of fermented fish products could uncover new therapeutic applications and nutritional advantages.
2. **Culinary Innovation**: Exploring new culinary uses and recipes that incorporate fermented fish products can diversify their appeal and marketability.
3. **Economic Development**: Supporting local producers through capacity building, training, and access to markets can enhance economic opportunities and livelihoods.

VII. CONCLUSION

Traditional fermented fish products from North-East India are nutritionally rich and culturally significant. They provide essential nutrients, promote gut health, and play a vital role in the culinary and cultural practices of the region. The preservation and promotion of these foods are crucial for maintaining the cultural heritage and nutritional well-being of the communities in North-East India. As global interest in fermented foods continues to grow, these traditional products offer valuable insights into the benefits of fermentation and the importance of preserving culinary heritage. By understanding and appreciating the nutritional and cultural significance of fermented fish products, greater respect can be fostered for the diverse food traditions that enrich the global culinary landscape.

REFERENCES

[1]. Chakraborty, R., & Bhattacharya, P. (2020). Traditional fermented fish products of North-East India: A review. Journal of Ethnic Foods, 7(1), 1-8.

[2]. Das, A. J., & Deka, S. C. (2012). Fermented foods and beverages of the North-East India. International Food Research Journal, 19(2), 377-392.

[3]. Deori, C., Begum, S. S., & Deka, S. C. (2017). A review on traditional fermented foods and beverages of Assam, North-East India. International Journal of Food Fermentation Technology, 7(2), 207-220.

[4]. Ghosh, K., Ray, R. C., & Adak, S. (2020). Fermented fish products: Biochemistry, microbiology, and health benefits. In R. C. Ray & S. Adak (Eds.), Fermented Foods: Biochemistry and Biotechnology (pp. 225-246). CRC Press.

[5]. Kakati, B. K., Gogoi, B., & Tamuli, K. J. (2016). Microbiological and biochemical aspects of fermented fish products of North-East India. Journal of Food Science and Technology, 53(1), 1-12.

[6]. Majumdar, R. K., & Basu, S. (2017). Characterization of traditional fermented fish products of Northeast India. Journal of Food Processing and Preservation, 41(6), e13280.

[7]. Patra, J. K., Das, G., Paramithiotis, S., & Shin, H. S. (2016). Kimchi and other widely consumed traditional fermented foods of Korea: A review. Frontiers in Microbiology, 7, 1493.

[8]. Roy, P. K., Baruah, A., & Dutta, A. (2014). Traditional fermented foods and beverages of Assam. Journal of Ethnic Foods, 1(2), 69-75.

[9]. Saikia, S., Deka, S. C., & Deka, K. (2018). Probiotic potential of traditionally fermented fish products of North-East India. Journal of Applied Microbiology, 125(2), 456-467.

[10]. Saha, P., & Ray, R. (2019). Fermented fish products of India. In A. Sarkar (Ed.), Fermented Foods: Part II (pp. 173-187). Springer.

[11]. Das, A. J., & Deka, S. C. (2012). Fermented foods and beverages of the North-East India. International Food Research Journal, 19(2), 377-392.

[12]. Devi, S. S., & Kumar, P. S. (2018). Nutritional and microbial profile of Ngari: A traditional fermented fish product of Manipur. Journal of Food Science and Technology, 55(3), 967-977. https://doi.org/10.1007/s13197-017-2997-6

[13]. Devi, S. S., Suresh, A., & Halami, P. M. (2020). Traditional fermented fish products of Northeast India: A review on its production, nutritional composition, and microbiological quality. Food Bioscience, 36, 100622. https://doi.org/10.1016/j.fbio.2020.100622

[14]. Jeyaram, K., Singh, T. A., Romi, W., Devi, A. R., Singh, W. M., Dayanidhi, H., ... & Tamang, J. P. (2009). Traditional fermented foods of Manipur. Indian Journal of Traditional Knowledge, 8(1), 115-121.

[15]. Majumdar, R. K., Roy, D., Bejjanki, S., & Bhaskar, N. (2021). Fermented fish products in South and Southeast Asian cuisine: Microbial and functional aspects. Applied Microbiology and Biotechnology, 105(10), 4013-4027. https://doi.org/10.1007/s00253-021-11337-4

[16]. Oki, K., Rai, A. K., Sato, S., Watanabe, K., & Tamang, J. P. (2014). Lactic acid bacteria isolated from ethnic preserved meat products of the Western Himalayas. Food Microbiology, 44, 35-42. https://doi.org/10.1016/j.fm.2014.05.004

[17]. Rai, A. K., Tamang, J. P., & Palni, U. (2017). Microbiological studies of ethnic meat products of the Eastern Himalayas. Journal of Ethnic Foods, 4(3), 140-146. https://doi.org/10.1016/j.jef.2017.08.003

[18]. Sarkar, P., Nanda, P. K., & Das, S. (2015). Health benefits of fermented fish products. Journal of Nutrition & Food Sciences, 5(5), 1-6. https://doi.org/10.4172/2155-9600.1000423

[19]. Sha, S. P., & Kumar, S. (2020). Indigenous fermented fish products of Northeast India: A review on preparation, nutritional composition, and health benefits. Journal of Ethnic Foods, 7(1), 1-12. https://doi.org/10.1186/s42779-020-00056-1

[20]. Singh, T. A., Devi, K. R., Ahmed, G., & Jeyaram, K. (2019). Microbial and endogenous origin of fibrinolytic activity in traditional fermented foods of Northeast India. Food Research International, 115, 155-161. https://doi.org/10.1016/j.foodres.2018.08.021

[21]. Tamang, J. P. (2015). Naturally fermented ethnic soybean foods of India. Journal of Ethnic Foods, 2(1), 8-17. https://doi.org/10.1016/j.jef.2015.02.003

[22]. Tamang, J. P. (2020). Fermented foods and beverages of the world. CRC Press.

[23]. Thakur, N., Savitri, & Bhalla, T. C. (2018). Characterization of some traditional fermented foods and beverages of Himachal Pradesh. Indian Journal of Traditional Knowledge, 17(1), 185-193.

[24]. Thapa, N. (2016). Ethnic fermented and preserved fish products of India and Nepal. Journal of Ethnic Foods, 3(1), 69-77. https://doi.org/10.1016/j.jef.2016.02.003