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Popular Article

Delicious to Deadly Toxin: Uncovering a Global Culinary Crisis

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Abstract

India has vast species diversity and constitutes 10 % of the total fish species in the World. One of the most available species, pufferfish is poisonous to consume despite its nutritional advantage and delicacy worldwide. India is the third largest exporter of frozen pufferfish and China, Japan, and South Korea are the largest consumer for the same. However, these fishes are caught as by-catch due to a lack of domestic demand. Therefore, the development of organized supply and value chains in the domestic and export markets would help to utilize the available resources in India efficiently.

Introduction

India has a coastline of 8118 km with an Exclusive Economic Zone of 2.02 million km² (Vivekanandan,2022). It has diverse fishery resources with a record of 3200 native finfish species. Of these, 1555 are from marine, 931 are from freshwater, and 15 are from brackish water exclusively (NBFGR, 2023). India constitutes around 10 % of the total fish (33,059) species in the World. Of the total fish diversity from India, marine fishes constitute nearly 75 % whereas Andaman and Nicobar followed by the West Coast, shows the highest number of species (Gopi and Mishra, 2015). However, 70% of India's fish production comes from inland waters, and nearly 65% comes from aquaculture alone (NFDB, 2022). Nutritionally, Mohanty *et al.* (2016) found among the food fishes in India, shellfishes and marine fishes are good sources of sodium and potassium; small indigenous fishes provide calcium, iron, and manganese; cold-water fishes are selenium-rich food; and the brackish water fishes are an excellent source of phosphorous. However, one of the World's most delicious fish becomes deadly poisonous when it is not properly cooked which is none other than puffer fish/blowfish/globefish. It comes under the family Tetraodontidae, comprises 200 species and is recognised as the second most poisonous vertebrate



in the World after the “Golden Poison Frog” (Nath and Kundu, 2017).

Pufferfish trade and consumption

Puffer fishers are considered by-catch and non-commercial fish and are predominantly available in the Indo-West Pacific Ocean (Seetha *et al.*, 2023). It has the potential biomedical applications and is utilised for fish meal/poultry feed production, and the fleshy muscle is consumed as a delicacy food for human consumption (Kaleshkumar *et al.*, 2021).

According to the data source from TRIDGE (2023), during the year 2022, major buyers for frozen pufferfish globally were China, followed by South Korea, the United States and Japan. India was positioned third in exporting frozen puffer fish, with a share of 11 % after China (30 %) and the United States (13 %). Surprisingly, both import and export markets are dominated by the same countries such as China and the United States. However, the truth is China imported largely from India, Indonesia, Malaysia, Iran, Pakistan, Myanmar, New Zealand, Norway, and the United States and re-exported nearly 50 % of it to South Korea, Hong Kong, and the Philippines. Similarly, the United States imported largely from Brazil and re-exported completely to China, Japan, and South Korea. Japan has predominantly imported puffer fish from the United States and Russia. Thus, the ultimate and end consumers of pufferfish Worldwide are China, Japan, South Korea, Hong Kong, and the Philippines. India has exported about 147 million kg with a worth of 322 million USD to the World. The unit price of Indian puffer fish accounted for 2.2 USD/Kg.

Constraints in pufferfish utilization

Although puffer fish is consumed as delicacy meat, it kills the consumer within 4 to 6 hours of consumption with its neurotoxin due to the presence of toxin-synthesizing bacteria viz., *Pseudomonas* and *Actinomyces*. It is 100 times more toxic than cyanide when it is consumed as a normal fish without detoxification. The liver, gonad, intestine, skin and occasionally the muscles of puffer fish have this toxin that leads to a 60% fatality in people who consume it (Seetha *et al.*, 2023). Thus, this meat is properly cooked by the trained Chefs and consumed in the name of fugu in Japan. Though many cases have been recorded globally, the first case of poisoning in humans due to pufferfish consumption was confirmed in India in 2020, and the victim was a 23-year-old man from Veraval, Gujarat, who had unknowingly eaten this poisonous species and was fortunate to be saved (Indian Express, 2021).

Women migrant labour in pufferfish processing

In India, pufferfishes are predominantly distributed on the South Indian coast, especially in Kerala, Southern Karnataka, and Tamil Nadu. According to the study by Swathi and Chaniyappa, 2013 migrant women labourers from Tamil Nadu were involved in puffer fish processing from October to December at Mangalore harbour where they removed the gut, ovary,



and skin of the fish and earned Rs 250/day. The processed fish is segregated based on quality and transported to fish/poultry meal plants and export markets viz China and Malaysia due to the lack of domestic consumption demand. The price of puffer fish in the domestic market is less than Rs. 40/kg, whereas in the export market fetches nearly Rs.170 to Rs. 250 /kg.

Conclusion

Due to their low commercial value, pufferfish are primarily caught as by-catch in India. Additionally, these pufferfish bite other commercial fish and wreck fishing nets, and fishermen have trouble catching them alongside their main catch. However, the urge to catch these fish has recently intensified due to rising international demand and Indian cities like Mumbai. In order to effectively use the available resources to meet the Worldwide demand, the study indicated a need for proper supply and value chain mechanisms, particularly in the dry fish, fish meal, and export markets. Additionally, this would support the livelihood of migrant women labourers in the fish processing sector.

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