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A REVIEW OF AQUACULTURE WASTE GENERATION AND REGULATING LAWS IN INDIA

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ABSTRACT

Pollution is currently at its worst in highly populated urban-industrial areas in both developed and developing countries. Fish waste is a kind of solid waste that creates an unpleasant environment and causes pollution. The omega fatty acids (DHA and EPA) present in fish are the reason for growing global consumption, and many vegans have begun to add fish into their diet. As a result, waste from land-based fisheries has increased, resulting in solid and liquid waste. The vast majority of people are apathetic with their surroundings and the environment, and fishery debris is simply tossed wherever seafood is sold. Fish waste disposal raises environmental and disposal concerns. Many sanitation regulations have been proposed in India, but few have been successfully implemented in some areas.As a result, the government and the general public must be educated on environmentally beneficial methods of reusing these wastes, and legislation must be strictly enforced to guarantee that the rules are followed.

KEY WORDS : Aquaculture, Fishery wastes, Pollution, SWM, Viscera

INTRODUCTION

Environmental pollution is a worldwide concern with serious consequences for human health. Pollution is caused by both human and natural activities (Fereidoun *et al.*, 2007). Pollutants of various types have been introduced into ecological systems (Sabahi *et al.*, 2009). Solid waste can pollute the air, water, and land due to improper treatment and transportation, causing various environmental consequences and creating a health concern (Chadar and Keerti Chadar, 2017). A lot of wealthy countries dispose of their solid waste in the most irrational manner conceivable. Citizens are usually misinformed about waste management difficulties, and their casual attitude towards their garbage contributes to community challenges (Kumar and Agrawal, 2020). The solid waste released is heterogeneous in character, containing biodegradable wastes such as cellulose, hemicellulose, lignin, pectin, starch, protein, and lipids, as well as a variety of compounds such as detergents, inorganic chemicals, complex organic chemicals, and metals.

The fishing sector is extremely important to our country's socioeconomic development. It has been identified as a key source of income and employment since it supports the establishment of a diverse range of subsidiary enterprises, as well as a resource of low-cost and nutritious food and a foreign exchange earner. Furthermore, it provides a source of income for a huge section of the country's economically disadvantaged population. Globally, the processing of fish generates a tremendous amount of solid and liquid waste. It pollutes and destroys the environment particularly in commercial areas. As a result, the study was designed to discuss fish waste and the regulations that control it in order

to maintain our environment clean. The total amount of solid garbage generated in India is 160038.9 TPD (Tones per day), with 152749.5 TPD recovered with a collection efficiency of 95.4%. Waste is handled at a rate of 79956.3 TPD (50%) and landfilled at a rate of 29427.2 (18.4%). 50655.4 TPD, or 31.7% of total garbage generated, remains unaccounted. During the period 20 - 21, total solid waste generated in Tamil Nadu was 13422 TPD, of which 12844 TPD was collected, 9430.35 TPD was treated, and 2301.04 TPD was landfilled (Annual report 20-21, CPCB). Figure 1 represents the solid waste generated in India and Tamil Nadu between 2020 and 2021.

Significance of seafoods

Aquaculture has expanded dramatically in response to increased worldwide demand for fish and other crustaceans. Fish has a lot of protein and other nutrients. It contains the fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which aid to reduce the risk of cardiovascular disease. It also promotes the production of animal protein in order to meet the demands of a fast-growing population, produces high-value goods for export in order to earn foreign money, and creates jobs. Aqua foods are high in protein, peptides and amino acids, vitamins, minerals, omega-3 PUFAs, probiotics, polysaccharides, and bioactive substances, and have been shown to boost immunity against viral infections, such as influenza (Yao *et al.*, 2020; Suraiya *et al.*, 2022). The current emphasis is on exploring isolation processes and the roles of bioactive compounds produced from aquatic organisms in promoting immunity (Fig. 2).

During the last three decades, global fish production has climbed from 69 million to 93 million tonnes, while global aquaculture production has increased from 5 million to 63 million tonnes. In 2020, global aquaculture production reached a new high of 122.6 million tonnes, with 87.5 million tonnes of aquatic animals worth USD 264.8 billion and 35.1 million tonnes of algae worth USD 16.5 billion. In 2022, inland aquaculture produced 54.4 million tonnes, while marine and coastal aquaculture produced 68.1 million tonnes (FAO, 2022). India is the world's second largest fish producer, with the inland sector accounting for 65 percent of total output (The Economics Times, 2019; Geethanjali *et al.*, 2020).

The repercussions of fish waste and the accumulation

Fish processing generates waste in both solid and liquid forms, such as fish carcasses, viscera, skin,

Fig. 2. Aquatic organisms and nutrients

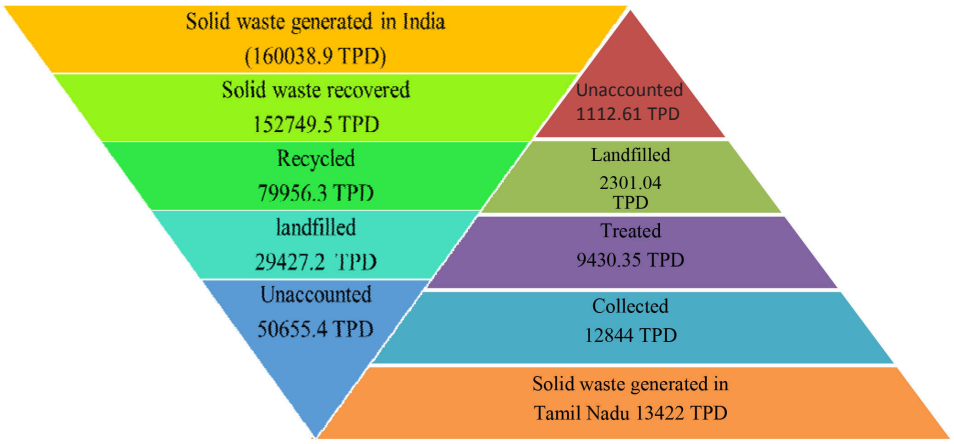

Fig. 1. Solid wastes generated in India and Tamil Nadu

and heads, as well as washing and cleaning water discharges, blood water from drained fish storage tanks, and brine (Michail *et al.*, 2006). Fish processing discards account for roughly 70-85% of total catch and are frequently abandoned on land or taken into the ocean. These wastes contain proteins and enzymes (Bhaskar and Mahendrakar, 2007). While certain by-products are utilized, the vast majority is wasted, raising disposal and pollution concerns (Norziah *et al.*, 2009). Until now, fish waste has been used to make low-cost fishmeal, fertilizer, and fish oil, or as raw material for direct feeding in aquaculture (Mo *et al.*, 2018).According to Nurdiyana and Mazlina (2009), India creates around 2 million metric tonnes of fish waste each year. Figure 3 displays some of the environmental consequences of seafood processing waste flows.

Furthermore, aquaculture waste water contains significant levels of nitrogen and phosphate, resulting in a continuous increase in total organic matter content, particularly in poorly maintained places. As a result, a variety of severe ecological effects such as a significant oxygen shortage, water degradation, and algal bloom may ensue. Eutrophication can also alter energy and nutrient fluxes, pelagic and benthic biomass and community structure, fish populations, sedimentation, nutrient cycling, and oxygen depletion (Fang *et al.*, 2004).

The majority of complaints about offshore trash disposal are about odours, floating debris and visible surface slicks, attractants of undesired predator species, increased turbidity, and dissolved oxygen deficiency in bodies of water. The rapidly degrading proteinaceous materials pose a risk of disease transmission to nearby residents. In addition, domestic animals roaming in the dumpsters may spread contaminants to human beings. During the rainy season, there is an increase in attendance at local health centers due to the prevalence of illnesses caused in part by microorganisms in flood-prone areas. To ensure pollution control, enforcement of pollution laws combined with waste recycling, proves beneficial to a large proportion of the population (Onokpise *et al.*, 2008).

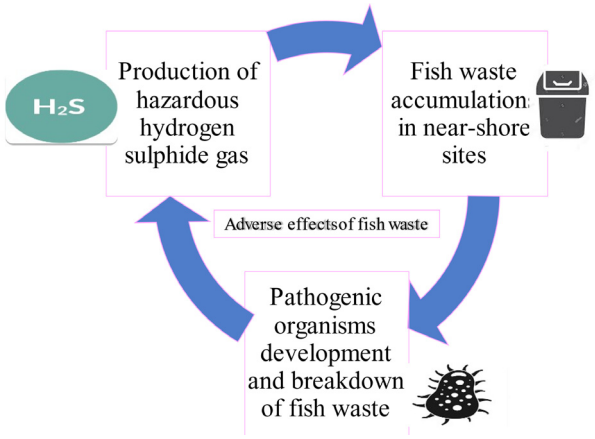

Fig. 3. Adverse environmental effects of fish waste

Laws Related to Cleanliness and Environmental Protection

Even if we are civilized, our activities, whether intentional or unintentional, degrade the environment, and as a result, our surrounds are dirty. As a consequence of this, ecology and environment suffer damage and degradation. It has negative health upshots. Despite the fact that fish excrement is derived from edible fish, it stinks and causes a variety of odour and clinliness issues. The government of India adopted many environmental protection legislations to sensitize the people about cleanliness, which are given in Fig. 3.

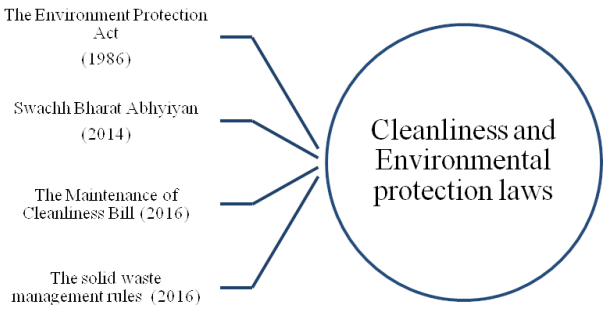

Fig. 3. Government legislation regarding environmental protection

The Environment Protection Act (1986)

The Act addresses all types of pollution (air, water, soil, and noise), establishes safe levels for the presence of various contaminants in the environment, forbids the use of dangerous materials unless previous authorization from the Central Government is obtained

Swachh Bharat Abhyiyan (2014)

It was established with an objective of Universal sanitation coverage and to focus on sanitation (www.sbm.gov.in).

The Maintenance of Cleanliness Bill (2016)

This law intends to outlaw certain actions like as spitting, urinating, and depositing waste in public spaces.

The solid waste management rules (2016)

It was established to provide training on solid waste management to waste-pickers and waste collectors.

Despite having enough norms and regulations, the inland fisheries sector is unorganized, resulting in the dumping of fish debris. As an outcome, the public should be educated on the importance of cleanliness and the environment.

CONCLUSION

Aquaculture has developed considerably and has become a globally important economic activity. It is now the fastest expanding food-producing sector, having the greatest potential to meet the increasing demand for aquatic food. Fish production has risen as a result of increased demand for fisheries products. These wastes from fisheries are especially perishable, owing mostly to the action of bacteria, who find the wastes to be an excellent growth medium.As a result, better control of these byproducts is required. Otherwise, everyone who generates rubbish in public places is subject to stringent laws and restrictions.

Conflict of Interest The author declare that they have no conflict of interest

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