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IMPACTS OF MICROPLASTIC IN AQUACULTURE ECOSYSTEM

P.Ruby, Jackqulinwino, M.Joshna, S.Selvaraj, Cheryl Antony, R.Jeya Shakila

Tamil Nadu Dr.J.Jayalalithaa Fisheries University

Dr.M.G.R.Fisheries College and Research Institute, Ponneri -601204

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Abstract

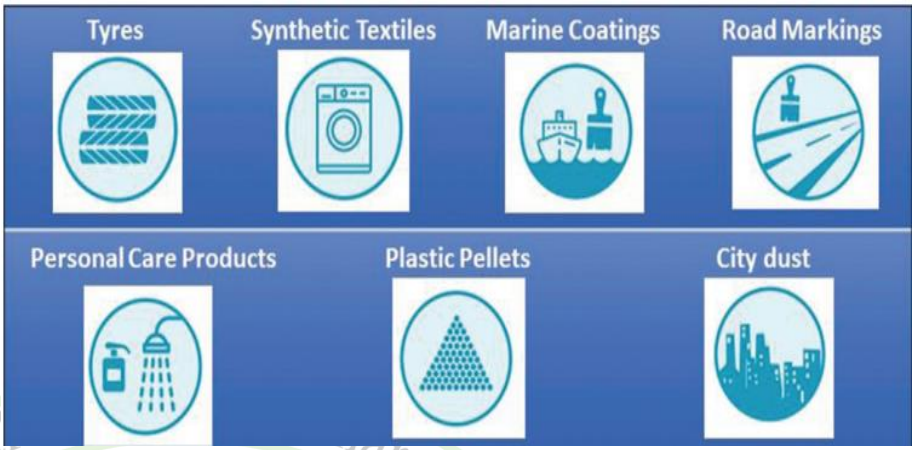
Microplastics (MPs) are regarded as a global issue due to their toxicity effects on fish and humans. Fish is a vital origin of human protein, which is necessary for body growth. The whole earth is drowning in various pollutants and garbage. Plastic pollution has garnered sufficient attention and there are various teams and organizations working toward cleaning our beaches, parks, and environment. However, all these actions will not suffice as plastics have trickled down into microplastics, which are posing a greater threat to our water systems and aquatic fauna. Research on microplastics is now on the rise, with new strategies and restrictions being put into place to curb its accumulation in our marine and freshwater environments. This review focuses on the adverse effects of microplastics in marine and freshwater ecosystems, with special focus on aquatic fauna. Many plastic products are not completely decomposed after being discarded, a lot of plastics form microplastics in the ocean, which poses a threat to the survival of marine ecosystem.

Key words: Microplastics, Fish, Aquaculture, Environment, Contamination

Introduction

Aquaculture, commonly known as aqua-farming, is regarded as the “agriculture of the oceans.” It is the cultivation (growing, rearing, breeding, and maintenance) and harvesting of algae, aquatic plants, fish, crustaceans, mollusks, and other organisms in varied aquatic environments that include ponds, lakes, rivers, and estuaries. “Microplastics” are the most prevalent plastic debris found in our marine environment (oceans, rivers, and lakes, including the Great Lakes). Most of the plastics will form plastic debris with a small particle size; plastics debris whose diameter is less than 5 mm is called microplastics.

Sources of Microplastics



Certain microplastic particles are derived from primary sources, that is, they are deliberately produced as microplastics. Other varieties emanate from secondary sources; Microplastic pollution has become an emerging environmental issue of global concern, microplastics in aquaculture have become a research hotspot. For environmental safety, economic efficiency and food safety considerations, a comprehensive understanding of microplastic pollution in aquaculture is necessary. Microplastics can be introduced into aquaculture environments in various ways. The sources of microplastics in aquaculture can be divided into microplastics introduced from the external environment (including river, marine, land and atmosphere) and microplastics introduced in during aquaculture process (including the aging and wear of plastic fishing gears, feeding and packaging of aquaculture products). Primary and secondary microplastics are widespread in sediment, water, and biota of both marine and coastal environments. Microplastic fragments are analogous to the size of feed elements and closely resemble the appearance of phytoplankton, zooplanktons, and suspended particles.

Plastic contamination of aquatic environments will continue to increase, resulting in growing amounts of micro- and nano plastics in these environments. There is some basic knowledge on the occurrence of microplastics in aquatic environments, organisms and seafood, but details are still lacking. Gaps in the occurrence of microplastics include details on entry rates and global distribution in aquatic environments and organisms, their distribution in the water column, and the specific contribution of the fisheries and aquaculture sectors to microplastic contamination.

Primary sources of microplastics

Microplastics from the external environment

The sources of river microplastics include industrial effluents, human activities, sewage treatment plants, agricultural activity (Kumar et al., 2021). In terms of industrial wastewater, textile wastewater is the main source of fibrous microplastics in rivers. Microplastics were found in sewage discharged from a textile industrial area in Shaoxing city, China and have had an impact on the local freshwater environment. Human activities also release microplastics into the environment. Microplastics are added to the daily necessities, including cosmetics, toothpaste and shampoo (Jiang, 2018).

Ropes and netting made from synthetic fibres offer greater strength and durability at a lesser weight when compared to natural fibres. Plastic materials are used in boat construction (including painting and anti-fouling coats), boat maintenance, fishing

gears (gill nets, trawl nets, dredge nets, traps, floats, lures, hook and lines), fish hold insulation and fish crates. In aquaculture plastic materials are used for seafood packaging and transportation, ropes, floats, fish crates and boxes, fish cages, pond lining, fish feeders and fish tanks.

Microplastics produced during aquaculture

- Fishing gears are used in aquaculture will inevitably introduce microplastics into the aquaculture environment. Due to long-term immersion, erosion, wear and collision, the nets, fishing ropes, floating balls and other plastic products used for cage culture and raft culture can generate microplastics.
- Fish meal and shrimp meal are high protein feed ingredients in aquaculture, mainly from wild-caught fish and shrimp. Due to the widespread existence of microplastic pollution, wild fish and shrimp as contaminated feed will introduce microplastics into the aquaculture environment during the feeding process.
- In addition, the aging and poor management of plastic products such as rubber gloves, rubber shoes and rubber aprons widely used by aquaculture practitioners will aggravate the pollution of microplastics in aquaculture areas

Conclusion

The multiple adverse effects of microplastics on aquaculture products mean a decline in aquaculture production. Microplastics cause multiple toxicological effects including oxidative stress in aquaculture products, as well as adverse effects on the behavior, growth and reproduction of aquaculture products, ultimately reducing the economic benefits of aquaculture products. We must start eliminate more pollution with various methods. In future work, the size, shape, and related contaminants should be considered to better evaluate the microplastics.

References

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