Perspective
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Treatment of Ammonia and Nitrite in Aquaculture Effluent

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Perspective

Aquaculture is a rapidly increasing agricultural sector that accounts for 47% of global human fish consumption. Aquaculture output is expected to increase by 60–100% during the next 20–30 years due to population expansion and rising per capita fish consumption. The intensification of aquaculture production will necessitate the use of more inputs, which will result in an increase in waste creation from the production systems.

Unfortunately, many aquaculture systems produce large amounts of effluent that are high in suspended particles, organic matter, total nitrogen, and total phosphorus and are released into rivers, lakes, and the ocean. Non-conservative water quality metrics such as total ammonia nitrogen (TAN), nitrite, nitrate, phosphate, biological oxygen demand (BOD), and chemical oxygen demand (COD) are so crucial that excessive levels kill aquatic life. Because the environment receiving high nitrogenous load aquaculture effluent has limited capacity to process and incorporate those nutrients into the food chain and biogeochemical cycles, a significant amount of nutrients tend to accumulate, causing ecological imbalance via eutrophication and hyper nitrification, which must be remedied. Effective wastewater treatment and disposal management strategies for nitrogenous compounds are required for any sustainable aquaculture system and water resources.

Biological methods are chosen over physical and chemical methods for wastewater treatment because to their low capital and running costs, low energy consumption, environmental friendliness, and public acceptance. The two major natural processes involved in the biogeochemical nitrogen cycle are nitrification and de nitrification. The former is a microbial process that involves the transformation of ammonia to nitrate by nitrifying bacteria such as *Nitrosomonas, Nitrosovibrio*, *Nitrosococcus, Nitrolobus*, and *Nitrospira.* De nitrification occurs when bacteria from the genera Nitrobacteria, *Nitrococcus, Nitrospira, Methanofollis* sp., *Bacillus* sp., *Pseudomonas* sp., *Paracoccus* sp., *Enterococcus*, and others employ nitrate as the terminal electron acceptor in their respiratory process. To improve contamination clean-up, a bio augmentation treatment system that includes nitrification and de nitrification can be used, which is based on the inclusion of pre-grown microbial cultures, either single or combination strains with synergistic and catalytic action, whether endogenous or not.

A system of this type will be more environmentally friendly and cost-effective. However, the effectiveness of the degrading process is heavily dependent on having the proper bacteria with the right skills in the right environment. Several bio remediates have been created and successfully used in the laboratory for the treatment of aquaculture wastewater. However, there is no literature on bio enhancement in aquaculture tanks. Motivated by the need to remove ammonia, the goal of this study was to discover and characterise bacteria of aquatic origin based on their ability to remove ammonia and nitrite from aquaculture effluent. The study tried to create a bacterial consortium since it is more efficient than single cultures at removing wastes from effluent water.

Finally, the assembled consortium is used as a bio augmentation agent to establish an environmentally friendly approach for the remediation of nitrogenous wastes such as ammonia and nitrite in aquaculture wastewater. For yellowish discoloration around colonies, use Griess-Ilosva reagent. Using the diphenylamine test, the isolates were tested for nitrite oxidation in nitrite calcium carbonate medium.

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