

Treatment of Aquaculture Effluent through Combined Phytoremediation and Biosorption Techniques

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Aquaculture has significant effects on the environment, the discharge of aquaculture wastewater without treatment causes several environmental impacts such as destruction of natural habitats, reduction in the abundance and diversity of plants and animals, and changes in the quality of soil, water, landscape, and vegetation. Therefore, the treatment of aquaculture wastewater is emphasized. This study focused on the use of phytoremediation techniques and biosorbents to remove contaminants from aquaculture wastewater and enhance the reusability of the treated water. In this context, a mini aquaculture system was developed, a phytoremediation unit with *Lemna minor* plant and a column structure packed with rice hull as biosorbent to treat the wastewater. The aquaculture wastewater was discharged to the phytoremediation unit and then discharged to a column structure packed with a rice hull of 43.2 g. The flow rate was maintained at 10 ml per minute and the Hydraulic Retention Time (HRT) of the phytoremediation unit was maintained for 3 days. The rice hull packed in the column was replaced with the new one weekly to enhance the removal efficiency. The maximum removal of Nitrate, Phosphate, BOD, and COD by the phytoremediation unit was 76.7%, 57.1%, 96.2%, and 67.6%, whilst the column structure packed with rice hull reduced the same at 48.5%, 53.2%, 36.5%, and 51.8% respectively. The performance of the total experimental setup was found to be 78.8%, 72.3%, 96.9%, and 77.5% respectively. The small sample t-test shows the combined phytoremediation and biosorption column setup was significant (p -value < 0.05) in terms of reducing nitrate, phosphate, BOD, and COD from raw wastewater.

Keywords: aquaculture, phytoremediation, bio-sorbent, column