Study on Utility of *Crassostrea madrasensis* Oyster Shells for Water Quality Improvement: An Alternative for Wastewater Treatment

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Oyster shell is a waste residue in sea food industry, thus waste accumulation can be minimized by reusing shells in environmental applications. Most biogenic structures act as adsorbents and biofilters in wastewater treatment. This study focuses on analysis of the potential use of *C. madrasensis* Oyster shells for removal of contaminants. Removal efficiency of heavy metals (Cu/Cd/Cr) and other physicochemical parameters in wastewater were tested in 7 treatments (different levels of thermally treated crushed oyster shells: 5 g,7 g, 9 g, 10 g, 11 g, 13 g and 15 g) for 24 hrs contact period. As results revealed, heavy metal adsorption capacity significantly changed with initial heavy metal levels and adsorbent masses ($p < 0.05$). Wastewater treated with 9g of shell powder had most efficient heavy metal removal rates for Cu (94.50 - 99.88%) and Cr (95.68 - 97.70%), while 99.16 - 99.64% of highest Cd removal rate was for wastewater treated with 11 g of oyster shells. Chitin in thermally activated shells make strong adsorption capacity, thus Oyster shells act as an effective biofilter in removal of heavy metals in wastewater. Average DO increased to maximum 37.73%, while highest removal efficiency of COD was 54.80% for 15 g of shell powder after 24hrs contact period. Initial PO_4^{3-} concentration significantly decreased with increased shell powder amount ($p < 0.05$) by flocculation of phosphorous with CaO in shells during 24hrs retention period. Highest phosphate removal capacity (85.9 - 56.2%) was found to be at 15 g of shell powder, indicating potential of application in eutrophicated water. Final pH was found to be increased to 6.5 - 8.5 which is optimum pH range for aquatic life. 24 hrs is the adequate contact period to equilibrate the reactions between adsorbent and waste water, hence preventing further releasing of chemicals of shells into treated water. This study reveals potential use of *C. madrasensis* Oyster shells for wastewater treatments as a low cost, environmental friendly alternative method.

Keywords: Bio-filter, Adsorption Capacity, Physicochemical properties, Wastewater treatment, Oyster shells