

Simultaneous Removal of Phosphate and Ammonium from Eutrophic Water Using Dolochar Based Media Filter

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Abstract : With the aim of enhancing the nutrient (ammonium and phosphate) removal from eutrophic wastewater with reduced cost, a novel media based multistage bio filter with drop aeration facility was developed in this work. The bio filter was packed with a discarded sponge iron industry by product, 'dolochar' primarily to remove phosphate via physicochemical approach. In the multi stage bio-filter drop, aeration was achieved by the process of percolation of the gravity-fed wastewater through the filter media and dropping down of wastewater from stage to stage. Ammonium present in wastewater got adsorbed by the filter media and biomass grown on the filter media and subsequently, got converted to nitrate through biological nitrification in the aerobic condition, as realized by drop aeration. The performance of the bio-filter in treating real eutrophic wastewater was monitored for a period of about 2 months. The influent phosphate concentration was in the range of 16-19 mg/L, and ammonium concentration was in the range of 65-78 mg/L. The average nutrient removal efficiency observed during the study period were 95.2% for phosphate and 88.7% for ammonium, with mean final effluent concentration of 0.91, and 8.74 mg/L, respectively. Furthermore, the subsequent release of nutrient from the saturated filter media, after completion of treatment process has been undertaken in this study and thin layer funnel analytical test results reveal the slow nutrient release nature of spent dolochar, thereby, recommending its potential agricultural application. Thus, the bio-filter displays immense prospective for treating real eutrophic wastewater, significantly decreasing the level of nutrients and keeping the effluent nutrient concentrations at par with the permissible limit and more importantly, facilitating the conversion of the waste materials into usable ones.

Keywords : ammonium removal, phosphate removal, multi-stage bio-filter, dolochar

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