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Study of Biological Denitrification using Heterotrophic Bacteria and Natural Source of Carbon

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Abstract : Heterotrophic denitrification has been proven to be one of the most feasible processes for removing nitrate from wastewater and drinking water. In this process, heterotrophic bacteria use organic carbon for both growth and as an electron source. Underground water pollution by nitrates become alarming in Algeria. A survey carried out revealed that the nitrate concentration is in continual increase. Studies in some region revealed contamination exceeding the recommended permissible dose which is 50 mg/L. Worrying values in the regions of Mascara, Ouled saber, El Eulma, Bouira and Algiers are respectively 72 mg/L, 75 mg/L, 97 mg/L, 102 mg/L, and 158 mg/L. High concentration of nitrate in drinking water is associated with serious health risks. Research on nitrate removal technologies from municipal water supplies is increasing because of nitrate contamination. Biological denitrification enables the transformation of oxidized nitrogen compounds by a wide spectrum of heterotrophic bacteria into harmless nitrogen gas with accompanying carbon removal. Globally, denitrification is commonly employed in biological nitrogen removal processes to enhance water quality The study investigated the valorization of a vegetable residue as a carbon source (dates nodes) in water treatment using the denitrification process. Throughout the study, the effect of inoculums addition, pH, and initial concentration of nitrates was also investigated. In this research, a natural organic substance: dates nodes were investigated as a carbon source in the biological denitrification of drinking water. This material acts as a solid substrate and bio-film carrier. The experiments were carried out in batch processes. Complete denitrification was achieved varied between 80 and 100% according to the type of process used. It was found that the nitrate removal rate based on our results, we concluded that the removal of organic matter and nitrogen compounds depended mainly on the initial concentration of nitrate. The effluent pH was mainly affected by the C/N ratio, where a decrease increases pH.

Keywords : biofilm, carbon source, dates nodes, heterotrophic denitrification, nitrate, nitrite
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