SCREENING OF DENITRIFYING BACTERIA TOWARDS REMOVAL OF NITRATE FROM GROUNDWATER

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Nitrate contamination in groundwater resources is becoming a serious problem in many parts of the world. World Health Organization's acceptable level for nitrate is 50 mg L^{-1} as nitrate ion (or 11 mg L^{-1} as nitrate-nitrogen) and for nitrite, it is 3 mg L^{-1} as nitrite ion (or 0.9 mg L^{-1} as nitrite-nitrogen) to protect bottle-fed infants (short-term exposure) against methaemoglobinaemia. Nitrate is considered to be a very important water pollutant in Jaffna District. Most of the well water in Jaffna District has exceeded the recommended level of nitrate, and many available methods for nitrate removal are expensive. Therefore, research has been initiated to study the potential of using microorganisms for this purpose. The aim of the present study was to identify the efficient nitrate reducing bacterial species isolated from different samples collected from Jaffna district. Morphologically different bacterial species (128 numbers) were isolated, and primary screening was carried out by modified bromothymol blue medium supplemented with KNO_3. Among them, 70 strains were selected for secondary screening as they are nitrate reducers. In secondary screening, assimilatory and dissimilatory nitrate reduction test was performed with nitrite (sulfanilic acid and α-naphthylamine) and Nessler's reagent, respectively. About 37 bacterial strains were identified as assimilatory nitrate reducers from secondary screening (nitrate reduced to nitrite and observation of gas bubbles). Among them, 15 strains were selected for further study with different carbon sources based on their efficiency in removing either nitrate or nitrite (more than 50%) on medium. Among these, fifteen strains GMC (sample ID) had the highest nitrate and nitrite reduction percentage (more than 80%) than others. More than 75% of nitrate reduction was observed with the strains of GMC IIIb II, GMC V, GMCVa, PM I and MSW XIb. Tentative identification of strains was carried out using biochemical tests towards carbon sources utilization and gram staining. GMC showed positive results for both glucose acid and starch hydrolysis test, and it was identified as a gram-positive bacillus. Other five strains reported above showed positive results with one of the carbon sources. It is concluded that there is a great potential in using locally available bacterial strains in removing nitrate from ground water either with glucose or starch as carbon sources.

Keywords: Methaemoglobinaemia, Bottle-fed infants, Assimilatory nitrate reduction, Dissimilatory nitrate reduction