Biological denitrification of contaminated water using immobilized *Pseudomonas fluorescens*

PROJECT REPORT
2010

Submitted in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING IN BIOTECHNOLOGY

Submitted to
VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELGAUM

Submitted by

Sai Archana	**1MS06BT044**
Sanjana Biswas	**1MS06BT046**
Tara Sriram	**1MS06BT059**

Under the guidance of

Dr. Archna
Asst. Prof, Dept. of Biotechnology

DEPARTMENT OF BIOTECHNOLOGY
M.S.RAMAIAH INSTITUTE OF TECHNOLOGY
MSRIT POST, BANGALORE - 560054

Abstract

Studies of groundwater in and around Bangalore have shown nitrate levels beyond the permissible levels as set by the WHO. Increase in the nitrate levels beyond this level has severe impact on human and animal health. Nitrate levels are limited due to health concerns in potable water. Nitrate is a common contaminant in water supplies, and especially prevalent in surface water supplies and shallow wells. Acute acquired methemoglobinemia is the most important adverse health effect caused by excessive nitrate or nitrite exposure. Maternal exposure to environmental nitrates and nitrites may increase the risk of pregnancy complications such as anemia, threatened abortion/premature labor, or pre-eclampsia. Nitrate is a stable and highly soluble ion with low potential for precipitation or adsorption. These properties make it difficult to remove using conventional water treatment methods. Biological denitrification has been found to be an effective method for denitrification, which is less polluting and safer for the environment. In this process, molecular nitrogen is formed through a series of gaseous nitrogen oxide products. Of the many living organisms that have the capacity to denitrify, *Pseudomonas* sp.. and *Bacillus* sp. show the most potential. *Pseudomonas* sp. is a soil microbe abundantly found in Bangalore soil.

In the current study, the organism used was *Pseudomonas fluorescens*, which was immobilized using various methods like sodium alginate and carrageenan. The carbon source used was acetic acid of varying concentrations. Nitrate concentrations were studied over a period of time, and a marked decrease in nitrate levels was seen. The experiments were conducted at a temperature of 37°C.

The denitrifying capacity of the organism was compared by applying various methods of immobilization and with varying concentration of carbon source. It was found that the organism immobilized with sodium alginate showed maximum denitrification for acetic acid concentration of 0.6% (vol) at a temperature of 37°C.