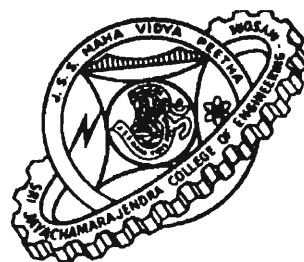


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**“EVALUATION OF CHITOSAN IN DIFFERENT FORMS FOR
REMOVAL OF NITRATE AND FLUORIDE FROM GROUNDWATER”**

Project work submitted in partial fulfillment of curriculum prescribed for the award
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ABSTRACT

Ground water provides drinking water for more than one half of nation population. The indiscriminate discharge of effluents into the nearby surface water bodies like lakes and rivers is a routine practice in most of the lakes. The effluents discharged into the surface water bodies percolate into soil finding pathway to join the ground water table. The effluent from septic tank also seeps through the soil to reach the ground water, thus polluting the ground water. In India the ground water contamination with respect to nitrate and fluoride has been observed in states like Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Orissa, Haryana, Bihar, Rajasthan and Gujarat.

The main objective of this study was to evaluate the compatibility of chitosan, one of the nature's most abundant biopolymer for its use in water treatment. In the present study nitrate nitrogen and fluoride removal was studied using chitosan as adsorbent in both flake and bead form. Ground water sample was collected from Nitrate and Fluoride contaminated borewells of villages in Kolar and Bangalore district and treatability studies were done using chitosan in different forms. Initial studies were done with synthetic water prepared by adding 0.00825 g of KNO_3 to tap water resulting in 50 mg/L of nitrate. Fluoride containing synthetic water was prepared by adding 0.01105 g of sodium fluoride to tap water to obtain 5 mg/L of fluoride and was treated accordingly using chitosan in flake and bead form.

From the series of batch studies conducted, it was found that chitosan has great compatibility for water treatment. Adsorption experiments were carried out for synthetic and ground water samples. Chitosan was used as adsorbent for the treatment of ground water. To optimize the condition for nitrate removal, synthetic water containing 54.73 mg/L of nitrate was used and chitosan flake dosages of 1 g, 1.5 g, 2 g and 2.5 g were added to batch experiments. Similarly for the fluoride removal, initial concentration of 5.06 mg/L was tried using chitosan flake dosages of 1 g, 1.5 g, 2 g and 2.5 g for a contact time of 30 minutes, 45 minutes and 60 minutes. The flake form of chitosan was found to remove 57.62 % of nitrate and 64.2 % of fluoride respectively, during contact time of 60 minutes at dosage of 2.5 g/L. The final concentration obtained for nitrate and fluoride are 23.19 mg/L and 1.81 mg/L respectively.

Adsorption experiments were also carried out with chitosan in bead form. To optimize the condition for nitrate removal, for initial nitrate concentration of 65 mg/L the protonated cross-linked chitosan bead (PCB) dosages added was 20 g, 30 g, 40 g, and 50 g per liter. Similarly for the fluoride removal batch experiments, initial fluoride concentration maintained was 4.83 mg/L and the chitosan PCB added was 20 g, 30 g, 40 g and 50 g per liter and the experiments were conducted for a contact time of 30 minutes, 45 minutes and 60 minutes. The chitosan PCB was found to remove 86.1% of nitrate and 74.74% of fluoride

respectively, during contact time of 60 minutes. The final concentration obtained for nitrate and fluoride are 9 mg/L and 1.22 mg/L respectively.

A reactor was also set up using water filter containing candles and the media used was chitosan flake and beads. Series of cycles were run by passing nitrate and fluoride contaminated water through it. The retention time was also maintained. The efficiency obtained for flake form for nitrate removal is 24.51 % and fluoride removal is 25.57 %. The efficiency obtained for bead form for nitrate removal is 37.44 % and fluoride removal is 12.25 %. This study showed that the use of chitosan in both the forms yielded extremely good results.