

BIO-DESALINATION PROCESS BY USING HALOPHYTIC MICROALGAE

Abstract

Water is an essential and needed part of our everyday life. In the 3/4 population, water scarcity is considered as a major problem and need to be solved for our sustainable life. Desalination is an environmentally friendly and energy-efficient process that takes away all the mineral compounds from the saline water. In the present study, microorganisms (algae) are used and tested for their potential in the desalination of marine water. Algae will be grown in different salinity concentration and nutrient conditions and the rate of growth rate, salt uptake will be measured periodically. In general, the purity of the water level below 500mg/l is tolerable for drinking. Purity will be calculated by Total Dissolved Solids (TDS).

Keywords: Desalination, algae, water purification, TDS,

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I. INTRODUCTION

Water was said in ancient scriptures that “Jalam Jeevamrutham”. This shows the importance of water to life. The global demand for water is rising. In the $\frac{3}{4}$ of the population, water is considered as the major problem. The water on the surface of the earth is found mainly in its ocean (97.25 percent) and polar ice caps and glaciers (2.05 percent), with the balance in freshwater lakes, rivers, and groundwater. Recycling and purification of water are more important nowadays. Because seawater contains large quantities of dissolved salts, it must be desalinated for most uses, including human consumption (Steven s. Zumadahl 2019). Various seawater desalination technologies have been developed to try to introduce new sources of water in an attempt to meet growing water needs. the second law of entropy is the efficiency of various systems (eg., MED vs RO). Electricity is a higher grade energy source than heat, and additional entropy is generated in the conservation from heat (or fuel) to electricity (Karan H Mistry *et al.*, 2011). Desalination is an eco-friendly and energy-efficient process that takes away all the mineral compounds from the saline water. The current desalination technologies consume a large amount of energy (4-8 kWh of electrical power per m^3 treated water) and required high capital investment. The state-of-the-art reverse osmosis technology is reaching the thermodynamic limits in the energy demand (M Elimelech *et al.*, 2011)

Desalination plant not only consumes huge energy, but they also affect marine life and discharge harmful by-product. Halophytic plants thrive in an environment with high salt concentration ions. Some halophile algae are not only salt tolerance but can concentrate multiple times more salt levels than the water they live (M A Khan *et al.*, 2006).

The present studies deal with the biodesalination process by using halophytic algae. *Chlorella Vulgaris* is used in the biodesalination process. *C. Vulgaris* having the capability to salt uptaken and inhibiting the growth of microorganisms like *e.coli*. the Bio-Desalination process with the help of Halophytic Algae is used to treat the sustainable solution to water scarcity. Genetic variation among two algae species, *Scenedesmus. sp.* & *C.Vulgaris* in their tolerance and uptake of salt (NaCl) was examined for potential bio-desalination of saline water. *C.vulgaris* was performed according to the method of slight modification in the concentration and volume. Briefly, reaction mixture contain 50 μ l of different concentration (50 μ g/ml corresponding to 1:1, 1:2, 1:3, 1:4 & 1:5 mM/ml) of seawater with *C.vulgaris*. Differentiation studies were carried out with *C.vulgaris* and a slight modification in the concentration of NaCl and volume mixture. NaCl was diluted in the distillation water reaction mixture contain the 50 μ l of different concentration (50 μ g/ml corresponding to 1:1, 1:2, 1:3, 1:4 & 1:5 mM/ml) of NaCl with *C.vulgaris*.

II. MATERIALS AND METHOD

1. Collection of Sample: The sample was collected in different sources of water like (pond, river, seawater, and rainwater). The sample was serially diluents the test tube in the 10 ml of solution. The BG-11 Medium was prepared it having vitamin b12 & thiamine, contains macro and micronutrients, trace elements and NaCl.

Isolation and Staining of Microalgae: To isolate single microalgae species from a different water sample, standard plating methods were fallowed using BG11 media. The field sample was first acclimatized in media for further isolation process. One milliliter of

the sample was transferred to a media plate and spread evenly by using the L-rod and across the surface. Inoculated plates were placed in a temperature-controlled incubator maintaining 25-30°C, where the algae were allowed to cultivate initially for about 5-7 days. Grown cultures were streaked onto additional sets of nutrient media plates 5 under sterilized conditions and placed back in the incubator for isolation. This streaking method was repeated until isolates of unialgae cultures achieved.

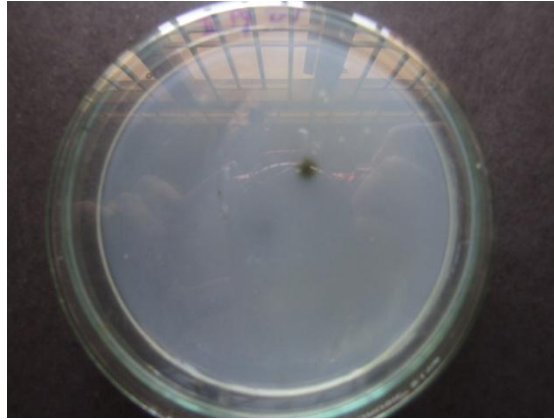


Figure 1

2. Physio-Chemical Analysis of Water Sample: Different kind of water quality test is achieved. Physical-chemical parameter of water is Nitrate, Sodium, Phosphate, Ammonium, Calcium, Chloride, Electrical Conductivity(EC), Salinity, Turbidity, Biological Oxygen Demand (BOD), Total Dissolved Solids (TDS) having calculated in the different periods of incubation. Comparative studies were undertaken before and after the treatment of water.

III.RESULT

The confirmation test of *Chlorella Vulgaris* was kept into the light microscope and cover with coverslip without led the air bubble in 10x, 40x & 100x.

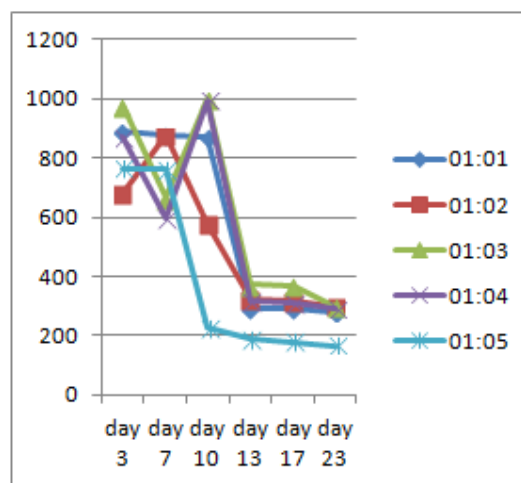


Figure 2

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