EXPLORING MICROALGAE'S POTENTIAL FOR SENSING AND BIOREMEDIATING EMERGING CONTAMINANTS

Syeda Qissa Zehra, Anoosha Ali Mirza, Mahnoor Fatima, Dr. Taqdees Malik
Department of Microbiology, Jinnah University For Women

IBRAS 2024

INTRODUCTION

We utilize microalgae for detecting and removing emerging contaminants in wastewater. Through mechanical, chemical, biological, and occasional electrical methods, we accumulate microalgae. Laser-induced fluorescence (LIF) measures toxicity by analyzing pigment fluorescence in response to laser light. This technique assesses changes in fluorescence intensity to determine the presence and concentration of contaminants. In wastewater treatment, we employ biosorption using microalgae, a metabolic process where pollutants, especially metal ions, bind to the biological surface. Algae as biosorbents are favored for their low nutrient requirements, high absorption capacity, and minimal environmental impact, effectively degrading contaminants in water without disrupting its characteristics.

METHODOLOGY

Step 1: (Biosorption) of Emerging Contaminants

- For this step we used marine water as our sample.
- Afterwards we inoculated algal biomass (*Chlorella vulgaris*) in our sample and then we centrifuged it for 5min to allow the binding of contaminants with the cell surface.
- Few contaminants e.g. metal ions and soil particles are also added from an external source for further confirmation of the impurities

Step 2: Measurement Of Contaminants

- A fluorometer with a 680-690 nm wavelength range was employed to measure contaminants. Fluorescence was observed at 0 minutes, 45 minutes, and 24 hours, indicating changes relative to the initial value. This variation helped to determine toxicity and contaminant concentration.

Step 3: Nanopore Filtration

- We employed a Nanopore filtration assembly with a nano-filter featuring a 0.001 micron pore size for water purification, specifically targeting the removal of algal cells.

RESULTS

- **Sample Collection**
- We have isolated 100 samples of algal species and after microscopy we have identified 25 species of chlorella vulgaris and after processing on these 25 samples we find out the result as under

Bioremediation

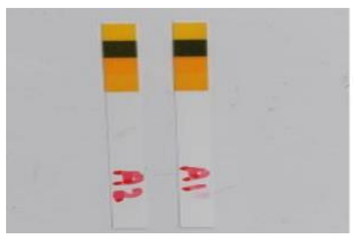
- After the process of Bioremediation we observed a clear water appearance

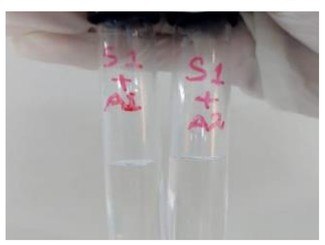
Measurement of Contaminants

- For the Measurement of Contaminants we took the fluorescence of waste water with algal sample at 0 min, 40mins and 24 hours. Through which we observe following readings:

Algal Sample	0 min	40 min	24 hours
Chlorella vulgaris	14000	12000	8000

- Nanopore filtration yielded pure water, with a pH of 7, making it suitable for human consumption.





CONCLUSION

Microalgae has demonstrated its ability to filter, concentrate, remove or biotransform a range of emerging contaminants. Direct treatment options include , bio-uptake, and biodegradation by the microalgal cells. It is extremely beneficial for the water industries, which provide clean drinking water, and for the food industries, which need clean water to manufacture items. This technique can also be used by various industries to make valuable products from the biomass produced by microalgae such as fertilizer, biofuels, algal plastics and fibers, and/or protein-rich feed.

REFERENCES

- Maryjoseph S, Ketheesan B. Microalgae based wastewater treatment for the removal of emerging contaminants: A review of challenges and opportunities. Case studies in chemical and environmental engineering. 2020 Sep 1;2:100046.
- Voznesenskiy SS, Popik AY, Gamayunov EL, Orlova TY, Markina ZV, Kulchin YN. Biosensors based on micro- algae for ecological monitoring of the aquatic environment.
- Ferro Y, Perullini M, Jobbagy M, Bilmes SA, Durrieu C. Development of a biosensor for environmental monitoring based on microalgae immobilized in silica hydrogels. Sensors. 2012 Dec 6;12(12):16879-91