REHABILITATION OF WATER CONTAMINATED WITH AN ORGANIC SOLVENT BY AN AEROBIC BACTERIUM: TOLERANCE AND BIOREMOVAL ASSAYS

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INTRODUCTION

The increasing use of organic solvents, and their consequent disposal in water streams without an effective treatment, continues to be one big environmental problem. The use of biological processes to rehabilitate contaminated systems has been seen as a cost-effective option and an environment friendly alternative to the conventional methods currently employed [1]. Studies conducted with bacteria revealed their great potential for hazardous contaminants removal through their adjustment to environmental changes [2]. In the present work, the objective is to evaluate the tolerance and bioremoval capacity of an aerobic bacterium strain, *Rhizobium viscosum* CECT 908, when exposed to different methylethylketone (MEK) concentrations in aqueous solutions. Although MEK may act as a source of carbon for the bacteria to ensure its biological activity, MEK's toxic properties may have an inhibitory effect on the microbial development.

[1] El-Naas, M.H., Acio, J.A., El Telib, A.E., 2014. Aerobic biodegradation of BTEX: Progresses and Prospects. J. Environ. Chem. Eng. 2, 1104–1122.
[2] Mojarad, M., Alemzadeh, A., Ghoreishi, G., Javaheri, M., 2016. Kerosene biodegradation ability and characterization of bacteria isolated from oil-polluted soil and water. J. Environ. Chem. Eng. 4, 4323–4329.

EXPERIMENTAL

Tolerance assays

Rhizobium viscosum in culture media

MEK (1.6 g/L to 11.2 g/L)

Stirring at 30ºC, 120 rpm for 30h

- ✓ The optical density (OD) was measured over time at 620 nm in a UV-Vis Spectrophotometer;
- ✓ OD was converted in biomass concentration by a growth calibration curve.

Bioremoval assays

1st: Biomass concentration

Rhizobium viscosum growth in culture media for 24h

To promote bacterial growth the previous inoculum was refreshed in a new culture media for 48h

Biomass centrifugation

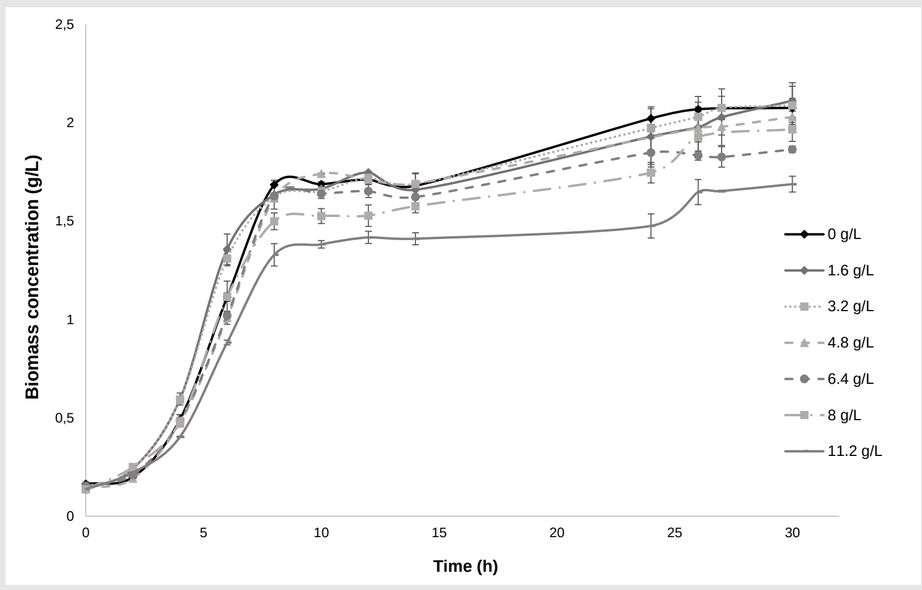
2nd: Batch assays with concentrated biomass

- ➢ Re-suspend biomass pellets in fresh culture media;
- ➢ Bioremoval assays performed with 6 $g_{biomass}$/L;
- ➢ Different initial MEK concentrations tested (1.6 g/L to 7.5 g/L).

Samples were analysed over time by gas chromatography (GC)

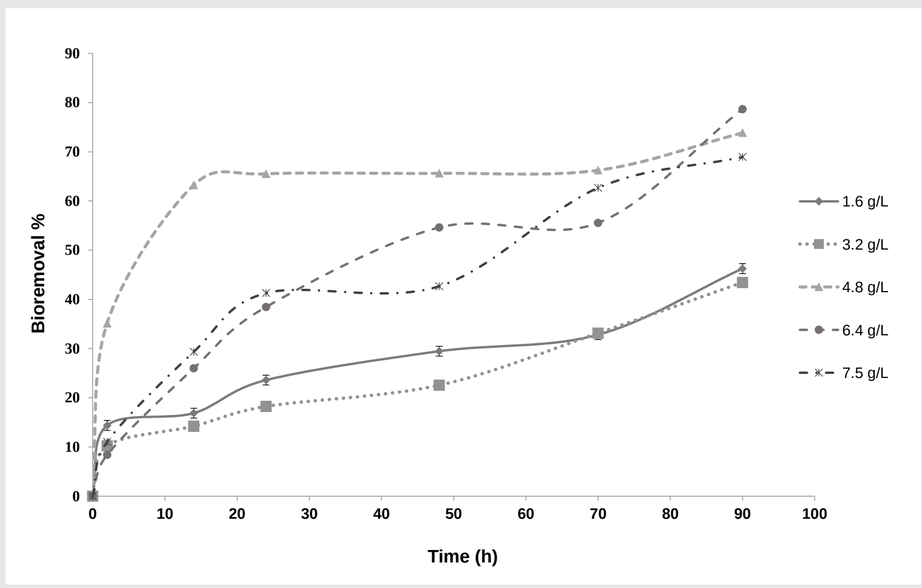
RESULTS AND DISCUSSION

Biomass concentration of *R. viscosum versus* time when exposed to different initial MEK concentrations



- ➢ The maximum specific growth rate achieved was 0.335 h^{-1} for 1.6 g/L of MEK;
- ➢ Inhibitory growth effect for initial concentrations higher than 1.6 g/L of MEK.

Bioremoval percentages for all concentrations tested as function of time



- ➢ The bioremoval percentages of MEK varied between 43 % to 79 %;
- ➢ The experimental data is best fitted by the pseudo-first order model.

CONCLUSIONS

- ✓ *R. viscosum* demonstrates the ability to grow in aqueous matrices with high concentrations of MEK;
- ✓ The bioremoval percentages of MEK achieved by *R. viscosum* varied between 43 % to 79 %, for all the tested concentrations;
- ✓ *As R. viscosum* revealed a good capacity to remove MEK, further studies should be performed in order to explore the capability of this bacteria to remove other ketones from water, as an environmental friendly process.

ACKNOWLEDGMENTS

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