Evaluation of novel thermo tolerant haloalkalophilic bacterium *Halomonas stevensii* for biomitigation of gaseous phase CO_2: Energy assessment and product evaluation studies

Dr. Somesh Mishra, Indian Institute of Technology Delhi (IITD), INDIA

Abstract (300 word limit)

Present work deals with the bio-mitigation potential of gaseous phase CO_2 by chemolithotrophic bacterium *Halomonas stevensii* isolated from haloalkaliphilic habitat using thiosulfate ion ($S_2O_3^{2-}$) as an energy source. *H. stevensii* was tested for various abiotic stress tolerance such as salt [1 - 14% (%w:v)], temperature (35 - 80 °C) and pH (4 - 12). Batch studies were conducted for 6 days at 15 (±1) % (%v:v) inlet CO_2 concentration to find the CO_2 fixing capability of *H. stevensii* under varying concentration of energy substrate i.e. 0, 50 and 100 mM $Na_2S_2O_3$. Approximately 98% CO_2 removal from gaseous phase was achieved at 50 and 100 mM $Na_2S_2O_3$. Biomass productivity was estimated in terms of maximum biomass productivity (P_{Max}) and specific growth rate (μ_{Max}). 6th day sample (biomass and supernatant) obtained from 100 mM $Na_2S_2O_3$ batch study was characterized by FTIR and GC-MS to identify the products formed from CO_2 fixation. The evaluation of CO_2 fixation by *H. stevensii* into primary metabolite was carried out by growing the *H. stevensii* at 5%, 10% and 15 % (% v:v) inlet CO_2 concentration for the duration of 6 days. The obtained leachate was further analyzed by GC for the quantification of fatty alcohols. The utilization of gaseous phase CO_2 by *H. stevensii* is also proven by conducting the approximate materials balance and energy assessment for the present CO_2 fixation process.

Image

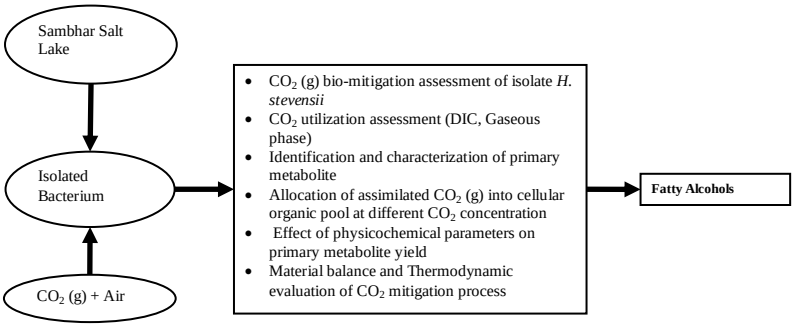


Fig. 1. Bio-mitigation of CO_2 using *H. stevensii* and its metabolization into fatty alcohols studies

Recent Publications (minimum 5)

1. **Mishra, S.**, Pahari S., Siva K., Mohanty S., Raghuvanshi, S., Gupta, S., **(March. 2018).** Investigation on CO2 bio-mitigation using *Halomonas stevensii* in laboratory scale bioreactor: Design of downstream process and its economic feasibility analysis. **Journal of CO2 Utilization**, **24, 274-286.**
2. Singh P., R., **Mishra S.**, Jha P., Raghuvanshi S., Jha P. N., **(March. 2018).** Effect of inoculation of zinc-resistant bacterium Enterobacter ludwigii CDP-14 on growth, biochemical parameters and zinc uptake in wheat (*Triticum aestivum L.*) plant. **Ecological Engineering, 116, 163–173.**
3. **Mishra, S.**, Singh, R., Chauhan, P., Raghuvanshi, S., Gupta, S., **(2017)**. CO2 sequestration potential of halo-tolerant bacterium *Pseudomonas aeruginosa* SSL4 and its application for recovery of fatty alcohols. **Process safety and Environmental Protection**, **111, 582-591.**
4. **Mishra, S.**, Raj, K., Raghuvanshi, S., Gupta, S., **(2017)**. Application of novel thermo-tolerant haloalkalophilic bacterium *Halomonas stevensii* for bio-mitigation of gaseous phase CO2: Energy assessment and product evaluation studies. **Process Biochemistry**, 55:133-145.
5. **Mishra, S.**, Pal, P., Raghuvanshi, S., Gupta, S., **(2016)**. Energetic assessment of fixation of CO2 and subsequent biofuel production using *B. cereus* SM1 isolated from sewage treatment plant. **Bioprocess and Biosystems Engineering**, 39:1247–1258.



Biography (150 word limit)

Dr. Somesh Mishra is working as an PostDoctoral Research Associate in Department of Chemical Engineering, IIT Delhi, Delhi, India. He completed his PhD from BITS-Pilani, Pilani campus in the year 2017. After completing his PhD, Dr. Mishra had joined Department of Chemical Engineering, Mnaipal Academy of Higher Education Dubai, UAE (MAHE Dubai) as an Assistant Professor from 13 September 2017 to 30th April 2018. He got his B.Tech degree in Chemical Engineering from Kanpur University in 2009 and completed his M.E. degree in Chemical Engineering with specialization in Petroleum Engineering from BITS-Pilani, Pilani campus in 2011. He has published more than 7 papers in reputed journals and 9 papers in national and international conference. His research interests include Carbon Capture and Utilization, Continuous Downstream Bio-processing, Process Development & Economics Analysis, Mass Transfer during biological processes, and Machine Learning. He was served as UGC-BSR fellows (University Grants Commission-Basic Science Research Fellowship, India) from year 2012-2013 and Council for scientific and Industrial research Senior Research Fellow India (CSIR-SRF) from 2013-2017. He is life time member of IICHE and served as faculty advisor for ACS Student Chapter at MAHE Dubai, UAE.

Email: somesh.mishra@pilani.bits-pilani.ac.in

Notes/Comments