Comparison of harvesting methods for the cyanobacterium *Microcystis aeruginosa*

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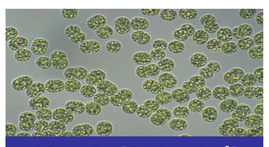
Introduction

Microcystis aeruginosa is a well-known cyanobacterium that has been spreading all over the world due to increased temperatures and eutrophication of water bodies caused by intensive anthropogenic activities. This toxin-producing microorganism is frequently responsible for diminishing water quality and causing intoxication of humans and animals. Due to this, its intracellular cyanotoxin - microcystin (MC) - is commonly used as tool for molecular and cell biology studies or as a standard in human and environmental risk assessment assays. Moreover, MC is a promising anticancer/antitumor drug candidate and a possible antimicrobial, antifungal, antialgal and insecticide agent. Despite MC's potential application in several biotechnological fields, its high production costs significantly contribute for the prohibitive selling prices (28000 €/mg). Thus, improvements in process' cost-effectiveness is needed, especially in terms of downstream processing techniques which are probably the major bottlenecks of cyanobacteria production at large scale, commonly representing 20-30 % of the total costs.
Bearing this in mind, this study aimed at optimizing harvesting of M. aeruginosa induced by pH change and compares the optimal conditions obtained with the use of three different flocculant agents: chitosan, ferric chloride, and aluminium chloride. Harvesting induced by pH was assessed by testing pH values ranging between 2 and 14.

Methods



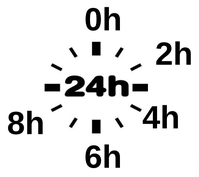
42 mL (0.5 g.L^{-1})

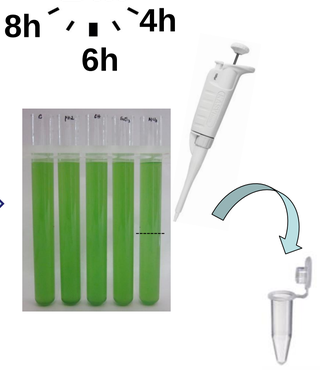
8000 rpm 15 min

Resuspended in distilled water

Methodologies

- Chitosan
- $FeCl_3$
- $AlCl_3$
- pH

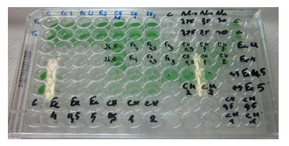




Analytical methods

Malvern Zetasizer
Zeta potential

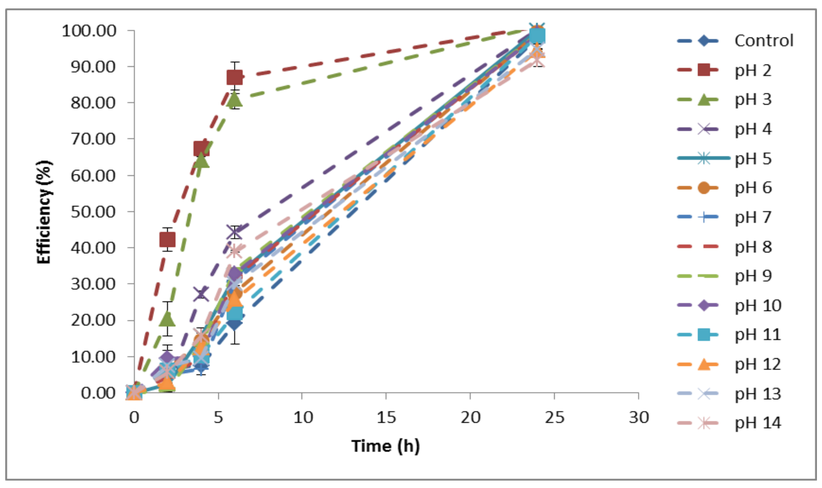
Abs 750 nm
Cell harvesting efficiency



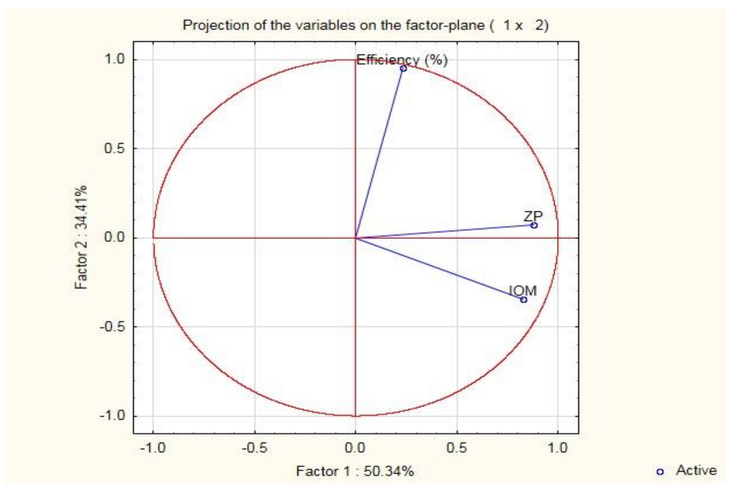
Intracellular organic matter (IOM) release
Abs 254 nm

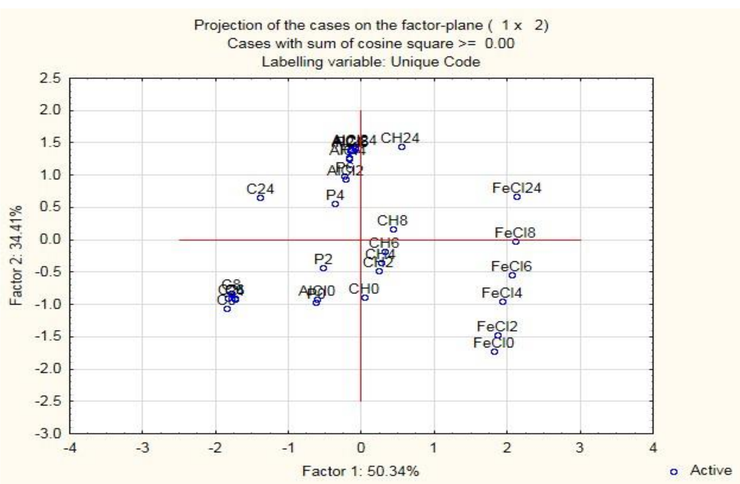
Results

Harvesting induced by pH

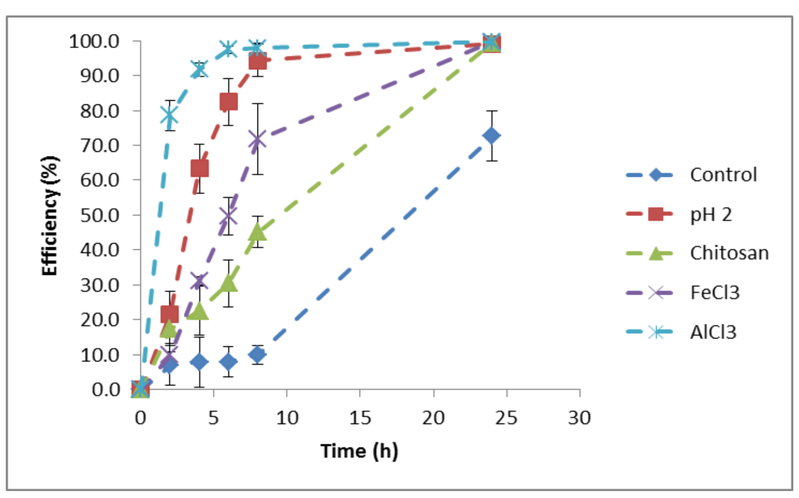


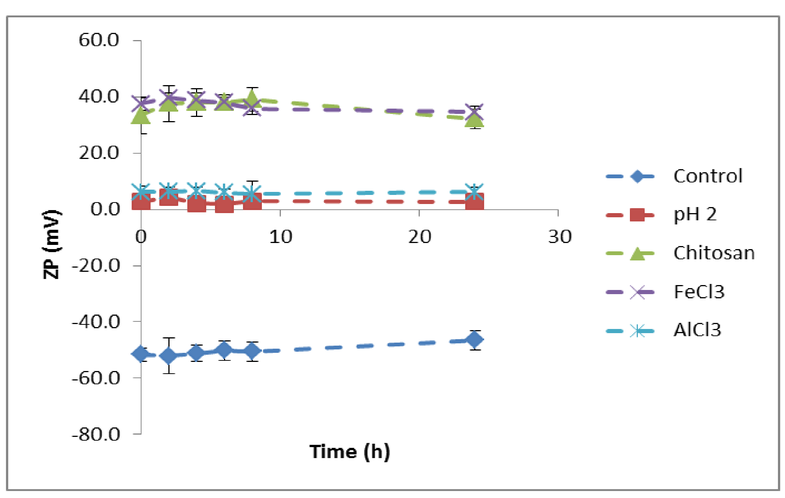
Multivariate Analysis



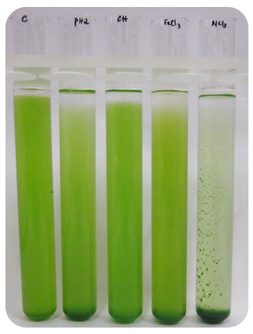


Comparison of optimal conditions: three different flocculant agents and pH 2





Conclusions



Addition of $AlCl_3$ was the most efficient method reaching nearly 90 % of harvesting efficiency within the first 4 h.

Zeta potential was found to play a significant role on harvesting process since assays where approximately neutral charge was measured shown higher efficiencies.

Acknowledgements

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