

Strategy for Managing Industrial Anaerobic Sludge through the Heterotrophic Cultivation of *Chlorella sorokiniana*: Effect of Iron Addition on Biomass and Lipid Production

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Abstract: Herein, the heterotrophic cultivation of *Chlorella sorokiniana* was systematically studied, allowing us to detect a nutritional deficiency other than the carbon source through assessing the oxygen transfer rate on glucose or acetate fermentations. In consequence, a mathematical model of iron co-limiting effect on heterotrophic microalgae growth was developed by exploring its ability to regulate the specific growth rate and yield. For instance, higher values of specific growth rate (0.17 h^{-1}) than those reported for the heterotrophic culture of *Chlorella* species were obtained due to iron supplementation. On the other hand, anaerobic sludge from the wastewater treatment plant of a baker's yeast company was pretreated to obtain an extract as a media supplement for *C. sorokiniana*. According to the proposed model, the sludge extract allowed us to supplement iron values close to growth activation concentration ($K_{\text{Fe}} \sim 12 \text{ mg L}^{-1}$). Therefore, a fed-batch strategy was evaluated on nitrogen-deprived cultures supplemented with the sludge extract to promote biomass formation and fatty acid synthesis. Our findings reveal that nitrogen and iron in sludge extract can supplement heterotrophic cultures of *Chlorella* and provide an alternative for the valorization of industrial anaerobic sludge.

Keywords: Anaerobic Sludge 1, *Chlorella sorokiniana* 2, Heterotrophic cultivation 3, Iron 4, Modeling 5.

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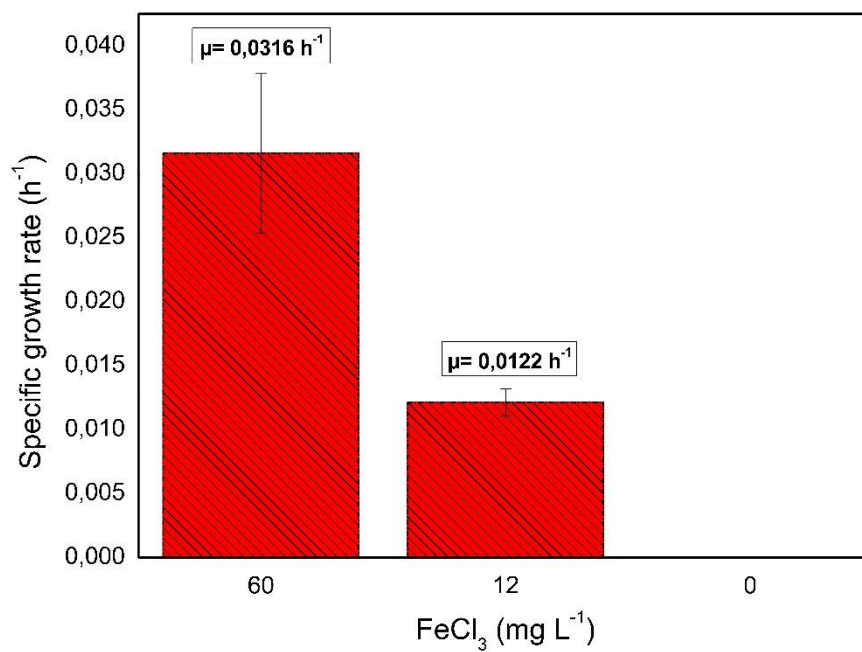


Figure S1. Specific growth rate increment calculated after iron addition (18-25 h) on the late exponential phase of the heterotrophic culture of *C. sorokiniana*.

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