

Microalgal biomass production in a raceway system using meat processing water as feedstock

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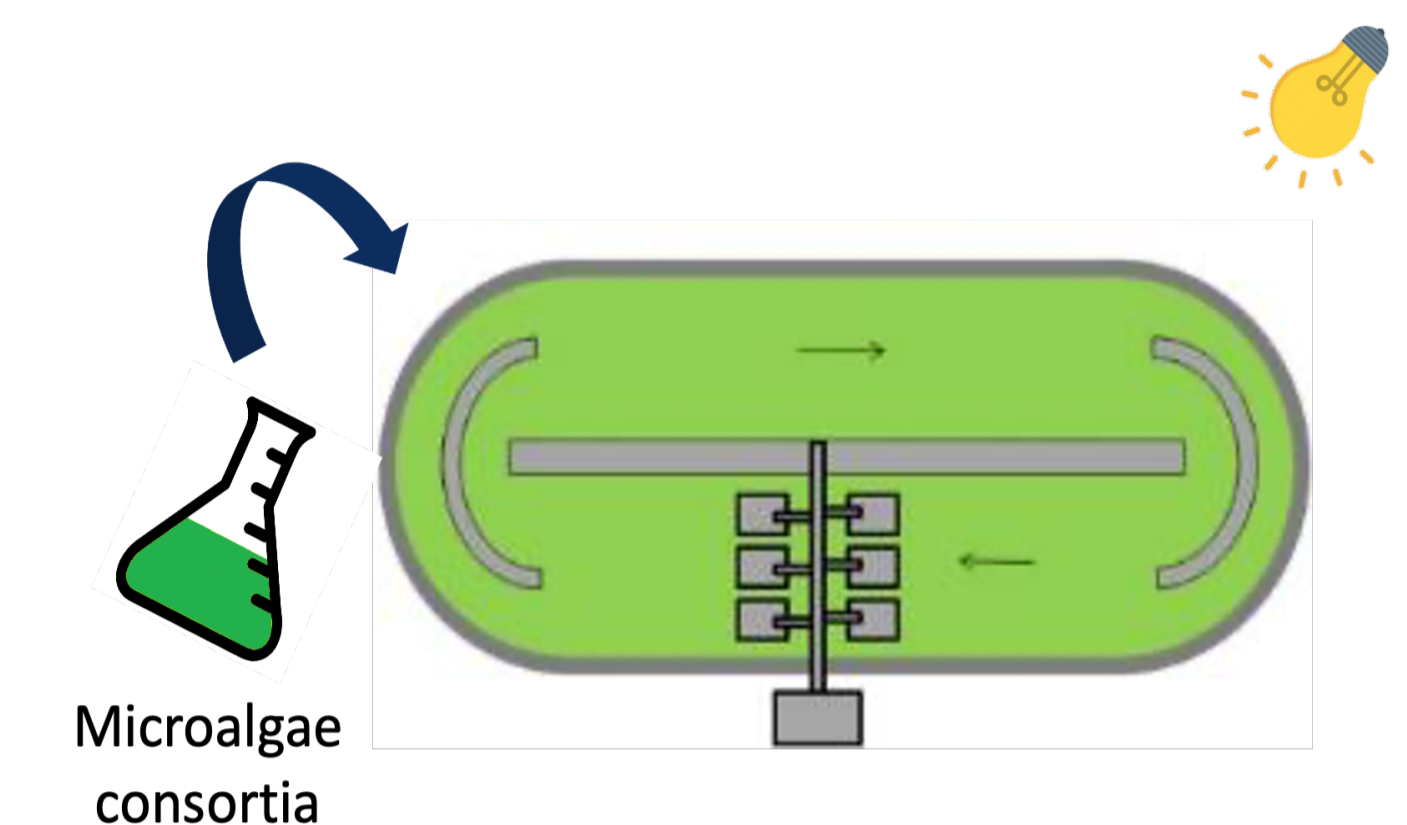
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Introduction

- Meat industry is responsible for the production of large volumes of water streams with a complex and high strength composition.
- The use of microalgae for reducing the organic and nutrient load of those effluents is promising with the plus that the microalgae biomass produced can be collected as an added value product;
- The aim of this study was to assess microalgae ability to grow in meat processing wastewater (MPWW), while improving water quality, using a raceway system.

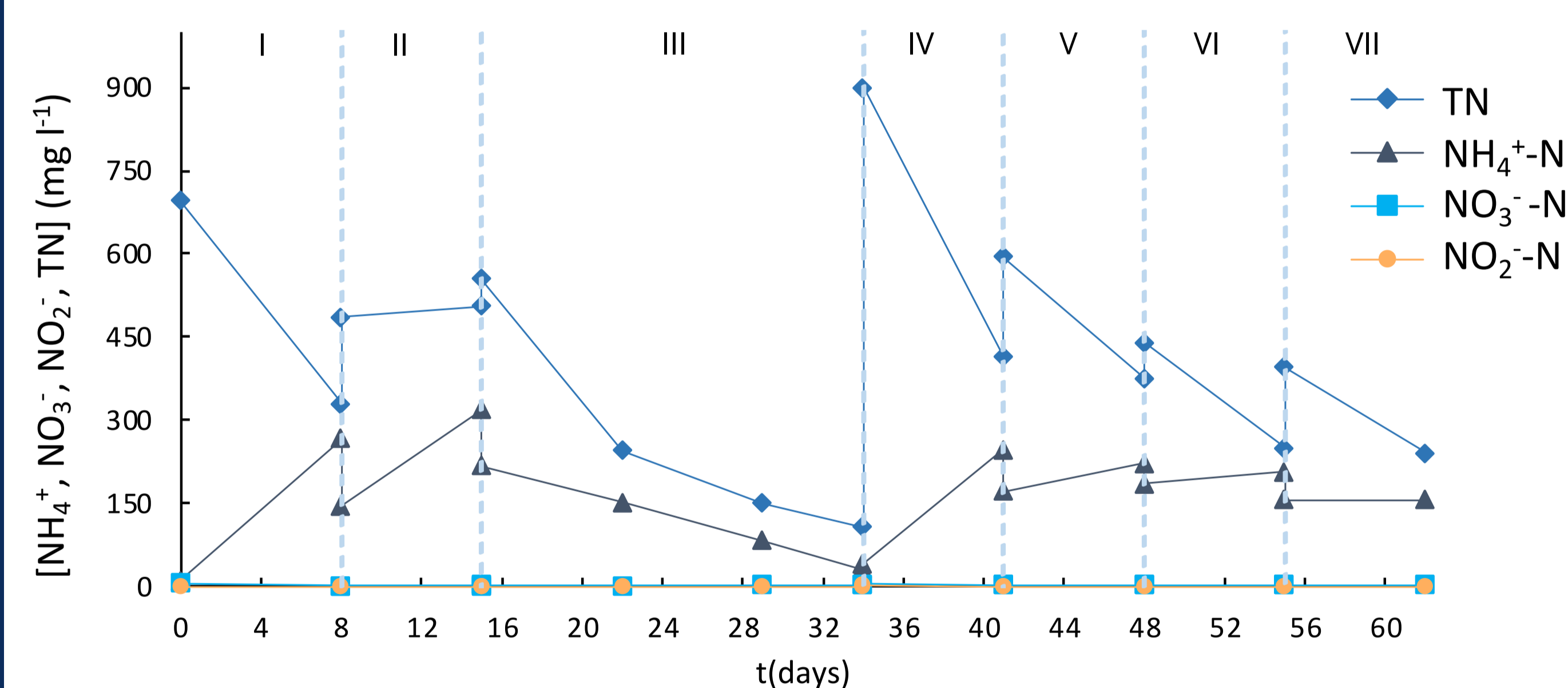
Methods

A prototype raceway system was inoculated with a microalgae consortium and was fed with MPWW collected at an industrial facility. The MPWW consisted of a 1:1 mixture of streams from the cleaning of cooking drums and the cooling processes. The raceway was operated over a 2 months period in fed-batch mode, with a total of 7 fed-batch cycles, under varying wastewater composition. Nitrogen and chemical oxygen demand (COD) removal was followed, and microalgae pigments concentration was assessed.



Results

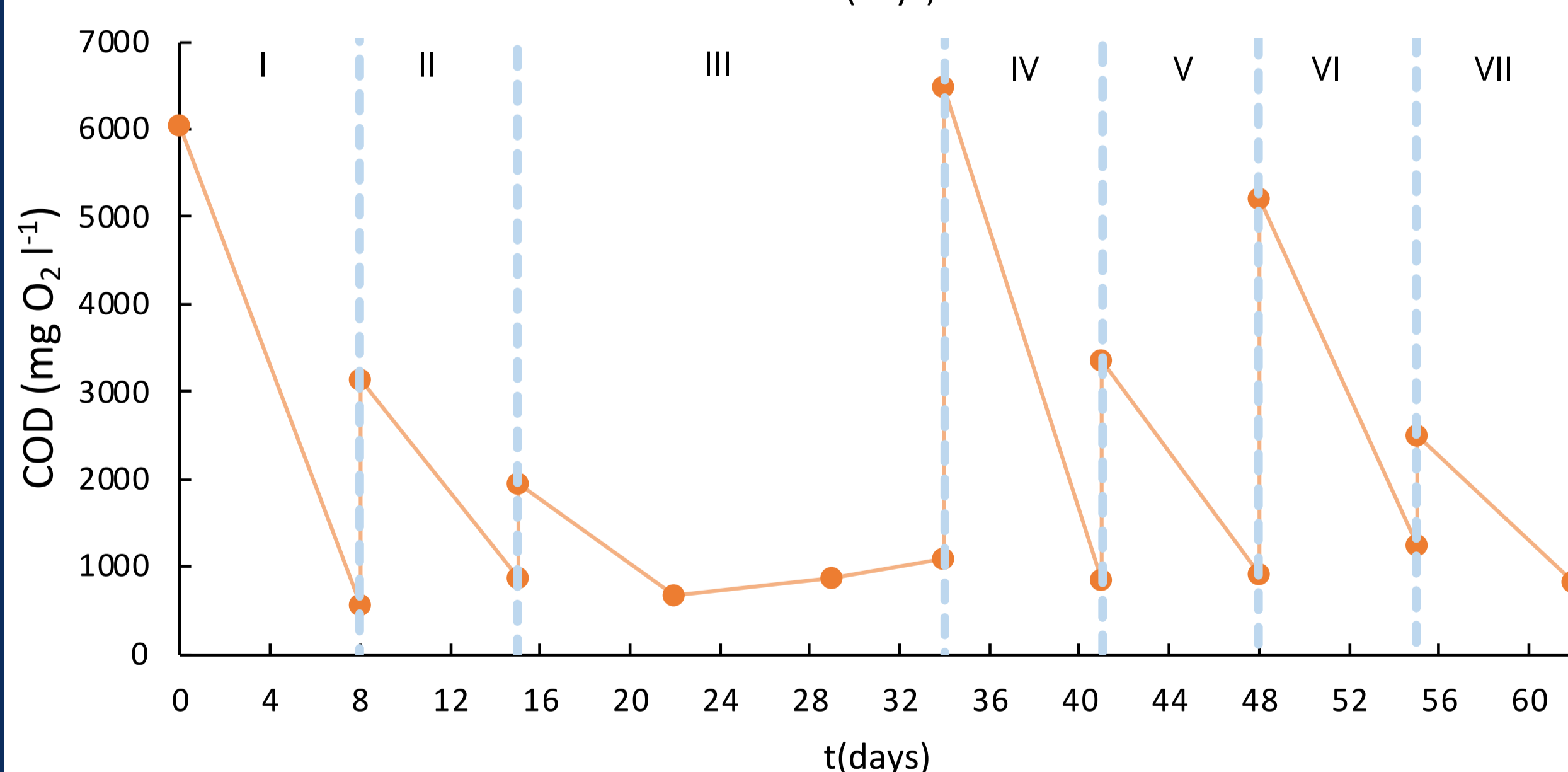
Nitrogen and COD removal



Total nitrogen (TN) concentrations decreased during each fed-batch cycle.

Ammonium concentration increased in almost fed-batch cycles, **except for the longer one (III)**, where a reduction of ca. 86% occurred.

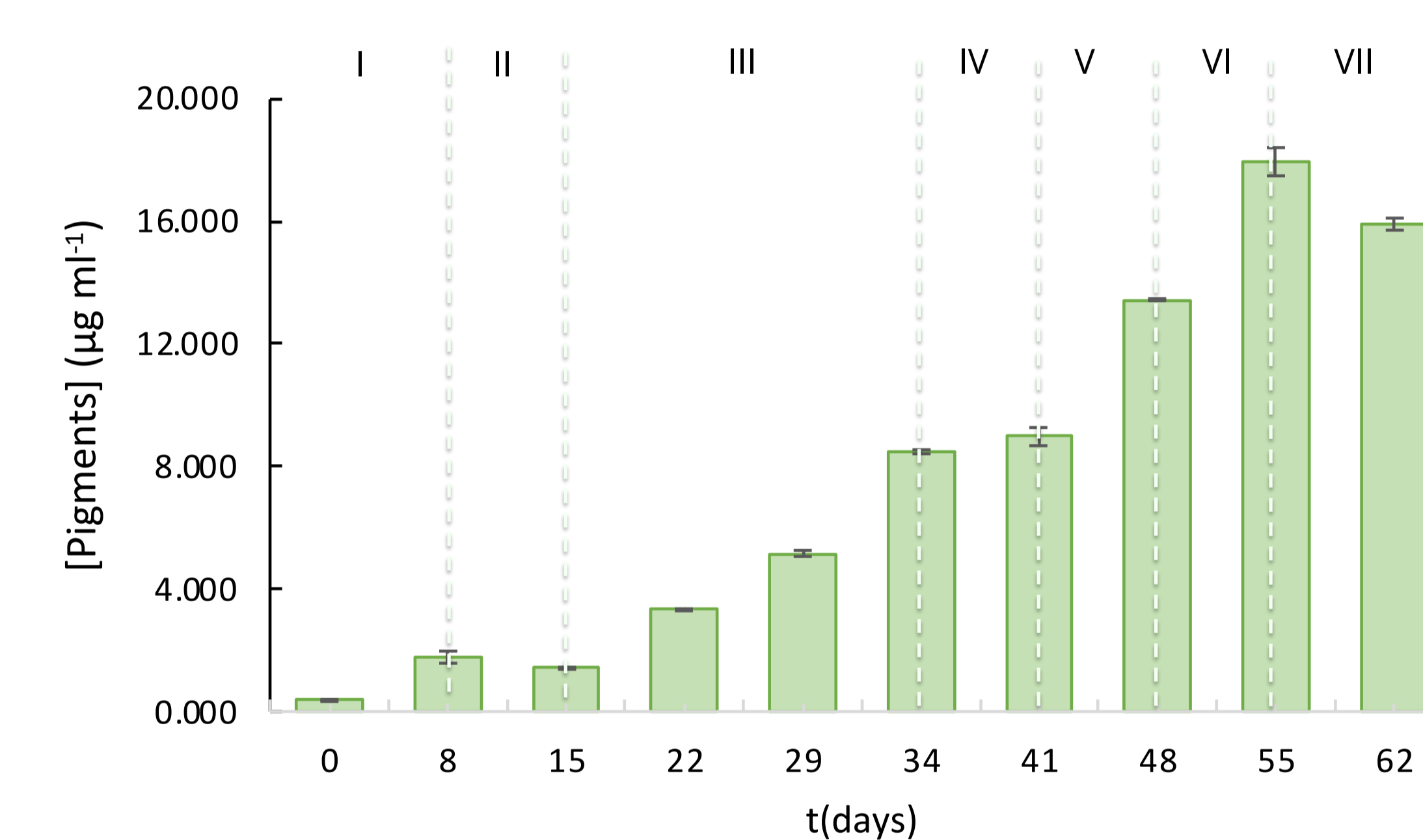
Residual nitrate and nitrite concentrations were observed during raceway operation.



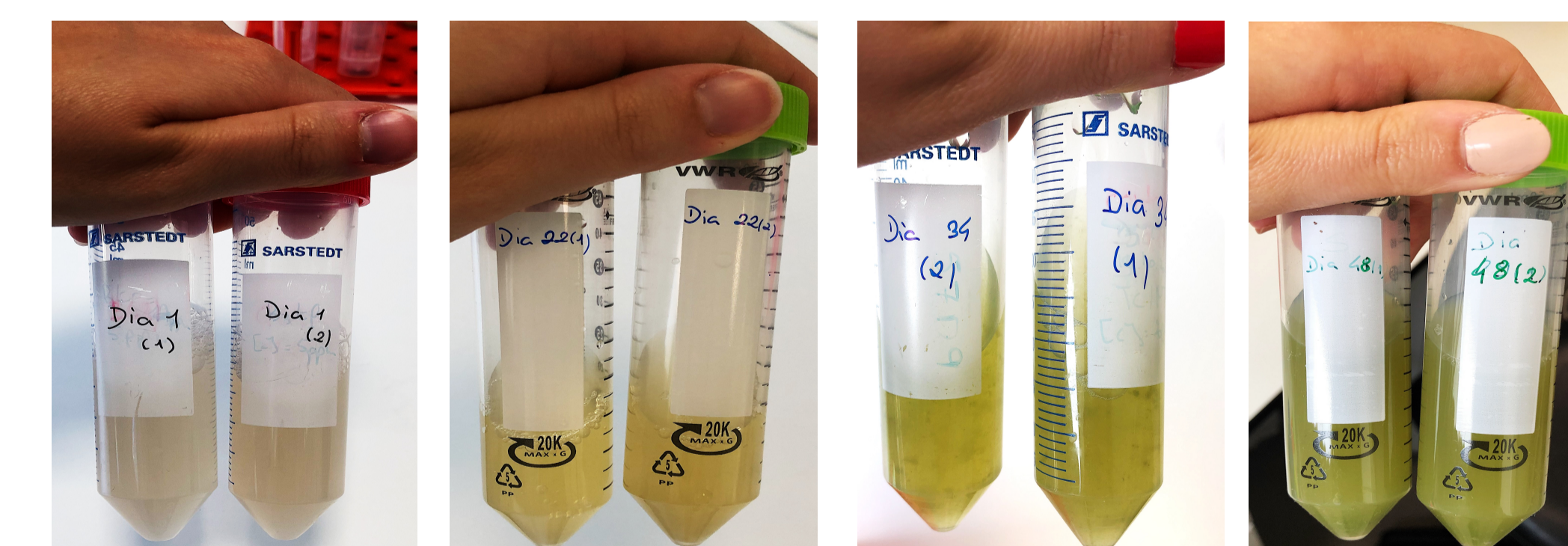
Fed-batch cycle	COD Removal rate (mg l ⁻¹ day ⁻¹)
I	685.3
II	324.0
III	181.3
IV	806.3
V	351.8
VI	566.0
VII	237.2

COD higher removal rates coincided with the feeding of **highly loaded MPWW** (high COD and TN content)

Microalgae growth assessment



Pigments concentration progressively increased over reactor operation, reaching a maximum of 17.9 µg ml⁻¹ at day 55.



Biomass green coloration developed through raceway operation

Microalgae were able to grow in meat processing wastewater.

Conclusions

- Microalgae were able to grow in wastewater with variable C and N concentrations;
- A longer fed-batch cycle seemed to improve NH₄⁺ removal;
- COD higher removal rates occurred when MPWW initial TN and COD concentration;

- COD removal is similar between each cycle, despite the initial values of the MPWW;
- Microalgae allowed wastewater depuration.

Acknowledgements

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