Metabolic modelling of *Nannochloropsis gaditana*

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Background

Microalgae are an interesting source for all kind of products including lipids. The marine species *Nannochloropsis* has the ability to accumulate large amounts of lipids during adverse growth conditions, such as nitrogen starvation. *Nannochloropsis* can also produce the omega-3 fatty acid eicosapentaenoic acid (EPA). Currently, the large scale production of lipids is not economically feasible yet. Therefore, improving the lipid productivity is necessary for an more economically feasible process.

Objective

The aim of the project is to identify process and/ or strain improvement to improve the lipid and EPA productivity in *N. gaditana*. A metabolic model will be used to gain insight in the lipid metabolism of *N. gaditana*.

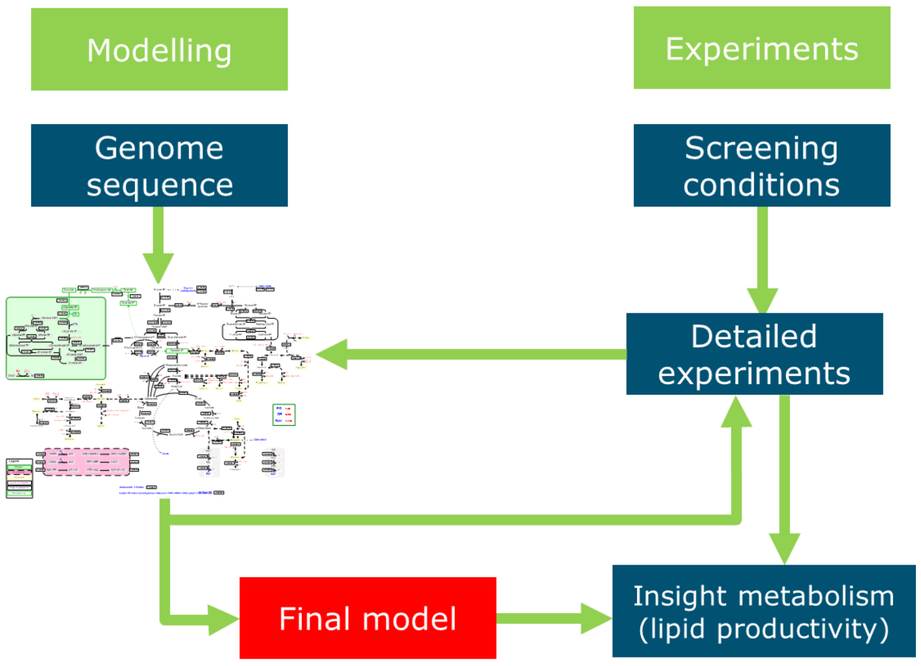

Figure 1. Schematic project overview

Approach (Figure 1)

Based on the available genome sequence of *Nannochloropsis gaditana* [1,2], a metabolic flux model will be made to gain more insight in the lipid metabolism. This insight in the algal metabolism will give opportunities to identify process and strain improvements to improve the areal lipid productivity. At the same time, different growth conditions will be tested and compared in lab experiments. From these experiments, interesting conditions will be identified that will subsequently be studied in more detail while simultaneously generating data for construction and validation of the model.

Preliminary results

In the first experiment *N. gaditana* was grown under nitrogen replete and deplete conditions in Erlenmeyer flasks. The growth was measured by daily dry weight measurements and daily samples for fatty acid analysis were taken.

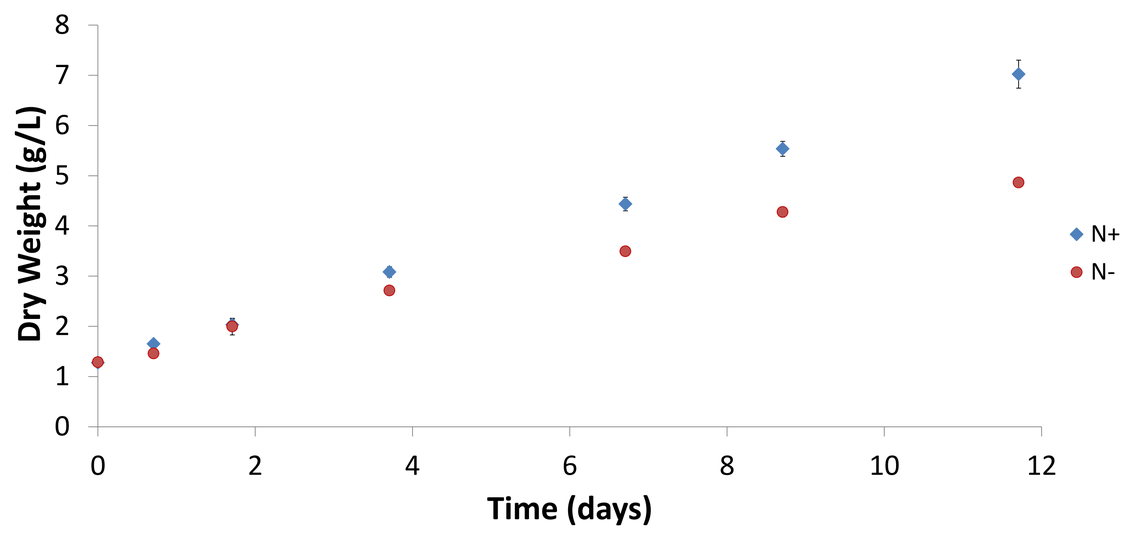

Figure 2. Growth curve based on the dry weight measurement for nitrogen replete (blue diamonds) and replete (red circles) cultures. Error bars indicate the standard deviation of triplicate measurements. After nitrogen depletion the biomass still increased with a factor 4. Of the newly produces biomass ~50% consist of fatty acids. The other 50% will be investigated during further research.

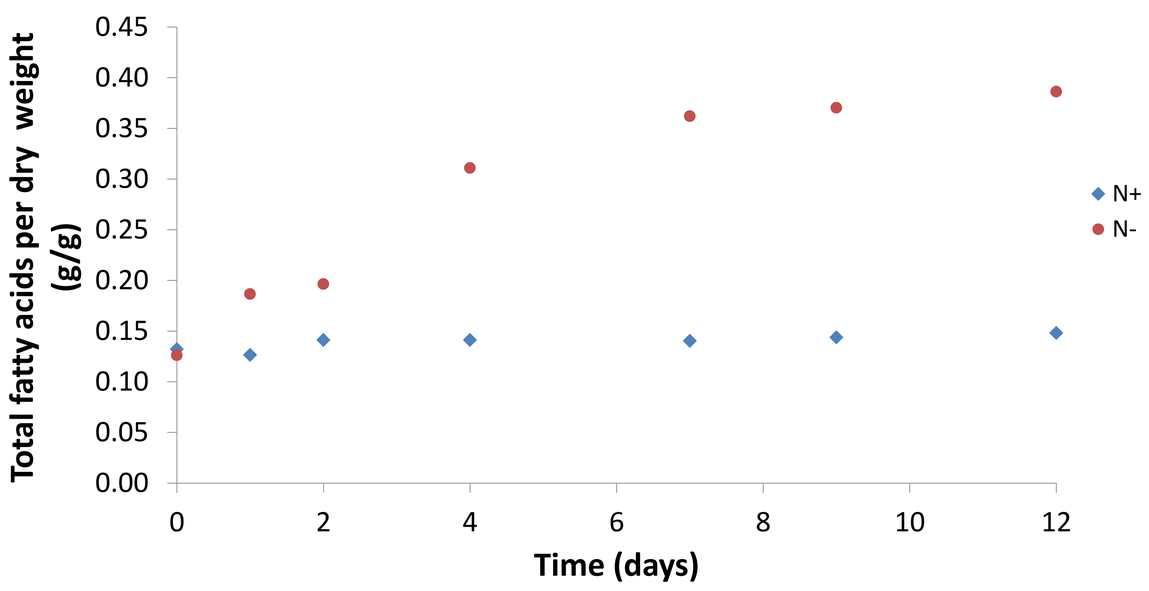

Figure 3. Total fatty acids per dry weight (in g/g) for nitrogen replete (blue diamonds) and deplete (red circles) cultures.

References

1. Corteggiani Carpinelli, E., et al., *Chromosome Scale Genome Assembly and Transcriptome Profiling of Nannochloropsis gaditana in Nitrogen Depletion.* Molecular Plant, 2013.
2. Radakovits, R., et al., *Draft genome sequence and genetic transformation of the oleaginous alga Nannochloropsis gaditana.* 2012. **3**: p. 686.

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