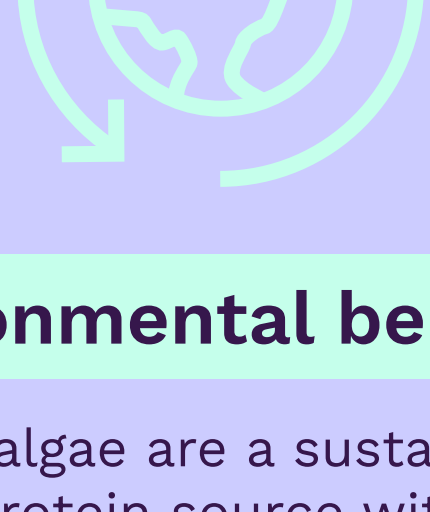


Sustainable Protein Production with Microalgae



Why microalgae?



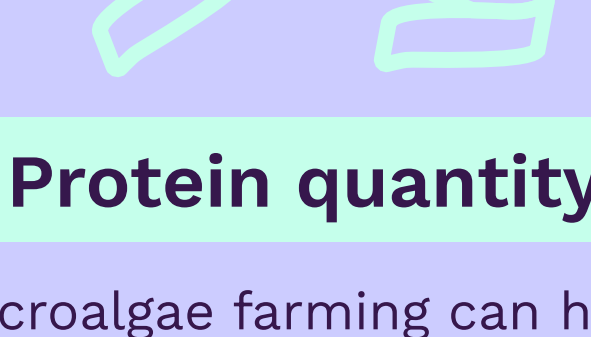
Environmental benefits

Microalgae are a sustainable protein source with environmental benefits over traditional protein production



Bioactive compounds

Microalgae produce bioactive compounds with potential health benefits, including antioxidant and anticancer properties



Protein quantity

Microalgae farming can help meet the growing global demand for protein



Protein content

Protein content in microalgae can be up to twice as high as conventional protein sources



Microalgae Production: Autotrophy vs. Heterotrophy

Did you know that different microalgae species can vary in protein content? Additionally, the protein levels can differ depending on their growth conditions

Algae species:

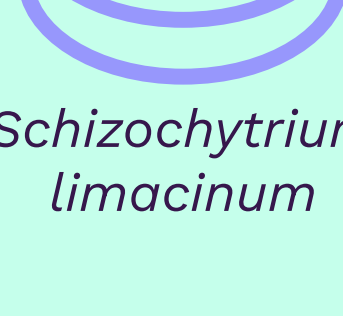
Selected species with high protein content:



Haematococcus pluvialis



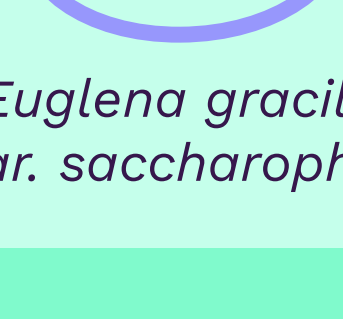
Galdieria sulphuraria



Schizochytrium limacinum



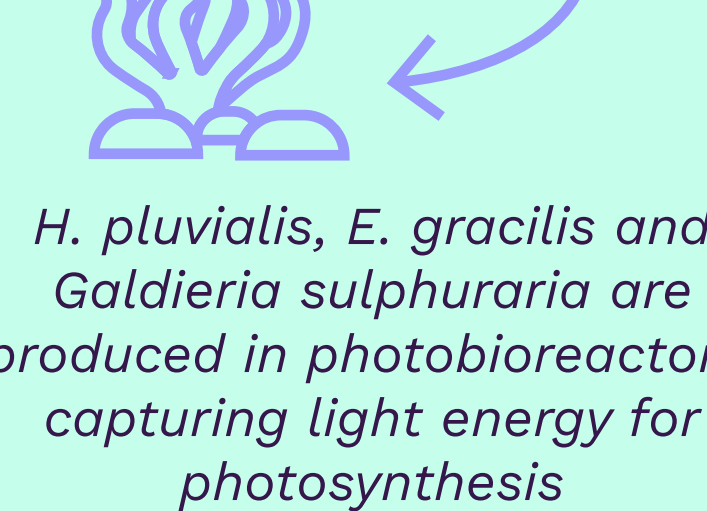
Euglena gracilis



Euglena gracilis var. saccharophila

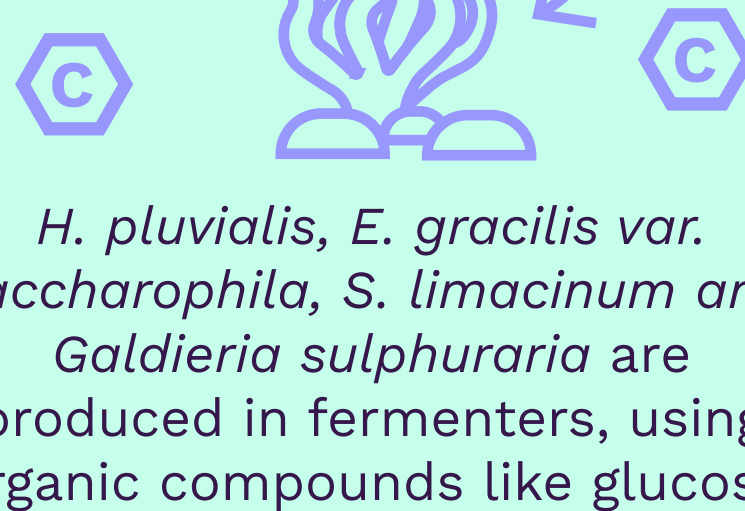
Production strategies

Autotrophy:

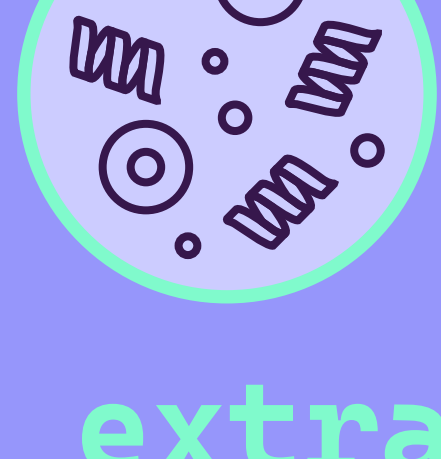


H. pluvialis, *E. gracilis* and *Galdieria sulphuraria* are produced in photobioreactors, capturing light energy for photosynthesis

Heterotrophy:

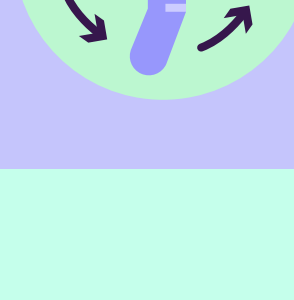
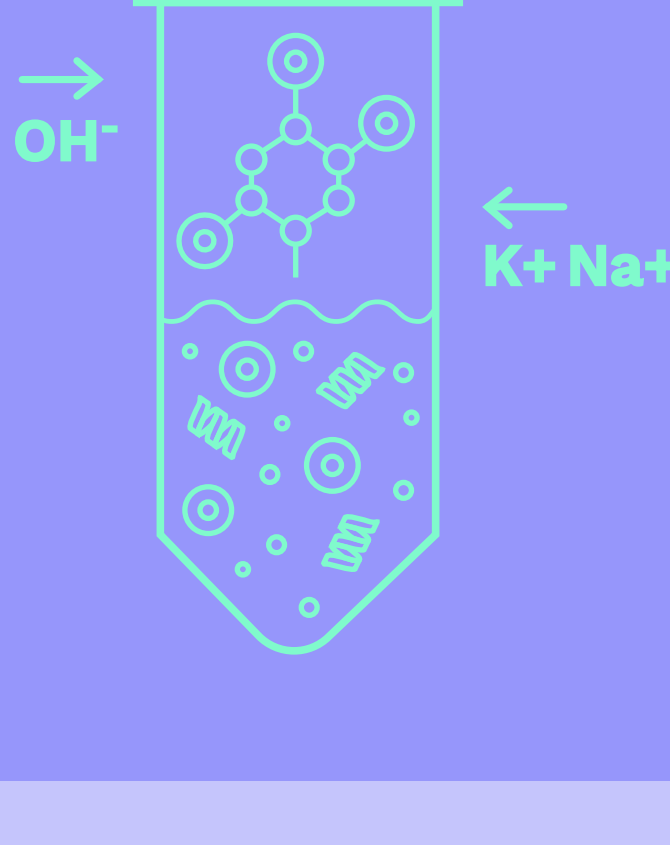


H. pluvialis, *E. gracilis var. saccharophila*, *S. limacinum* and *Galdieria sulphuraria* are produced in fermenters, using organic compounds like glucose as carbon source



Protein extraction: Novel "green" technologies

From several tested methods, extraction in alkaline medium assisted by dispersion technologies for cell wall disruption proved to be the most promising method and scalable technology for protein recovery



How does it work?

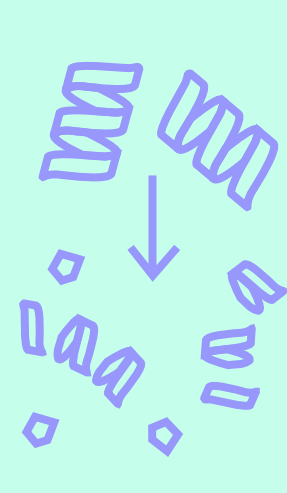
Shear forces from high-speed rotor efficiently release proteins



Protein purification and characterisation

1 Separation

Proteins broken into smaller components (peptides) by enzymatic hydrolysis (EH)



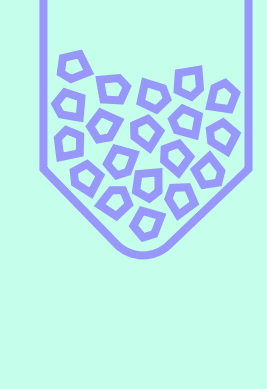
2 Ultrasounds

Combining EH with ultrasounds enhances results



3 Stabilization

Concentration and stabilization methods tested for market applications

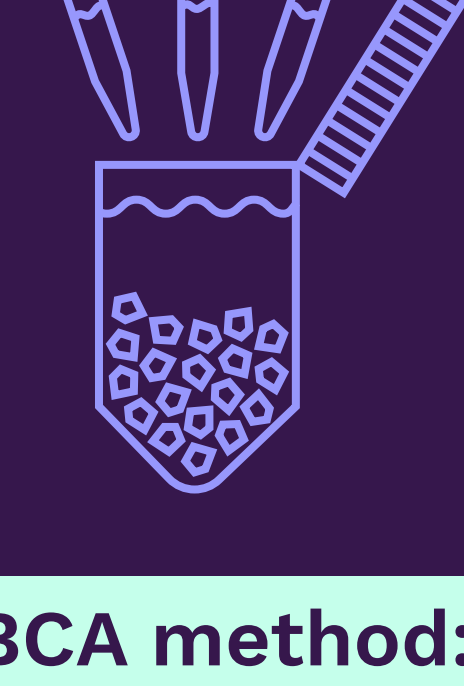


Evaluation methods



Kjeldahl method:

Measures nitrogen to estimate protein content



BCA method:

Colorimetric method for protein levels determination, using a purple reaction complex



Results

Produce protein-rich microalgae powders for future research and applications