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ALGAENET4AV PROGRAM JAN-FEB

OBJECTIVES

The *AlgaeNet4AV* project will take advantage of the *Chlorella* and *Nannochloropsis* strains whose technological and biological basis of culture are already available. Based on their rapid growth, well-established cultivation conditions, production of proteins and secondary metabolites, *Nannochloropsis* and *Chlorella* strains are of particular interest to many European industries including food, feed, and cosmetics for the production of high-added value bioproducts.

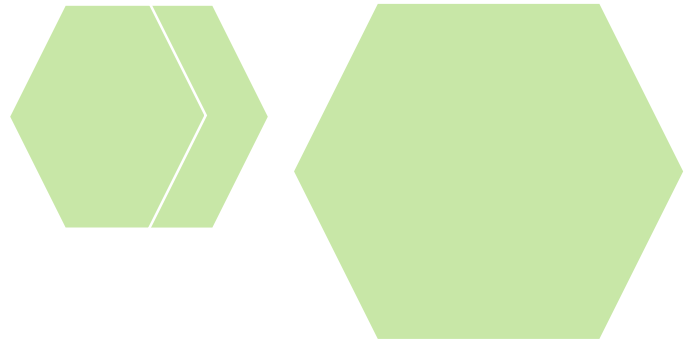
MICROALGAE

GENERALLY

Microalgae are very diverse, and adapted to a broad variety of environmental conditions, the chances to find novel and unexplored bioactive metabolites with properties of interest for biotechnological and biomedical applications are high. The potential of exploiting the microalgae-based ingredients with antiviral properties has already been documented, however due to the lack of systematic R&D efforts, these compounds are totally unexploited. Lectins and polyphenols from microalgae are compounds that display strong antiviral activities, that haven't been exploited so far.



Figure 1: Small - scale autotrophic cultivation of *Euglena* and *Nannochloropsis* (5L reactors)



OBJECTIVES

The *AlgaeNet4AV* project seeks to achieve the development of a sustainable cultivation system for microalgae, especially *Nannochloropsis* and *Chlorella*, and fully exploit their potential to produce biomass and valuable compounds while reducing the cost of production at the same time. In addition our aim here is to maximize the production of target compound regardless of the biomass production. Thus, our aim is to investigate and improve the necessary methodology and technology from the current status, and induce microalgae into producing the antiviral target compounds. This will be achieved by the following approaches:

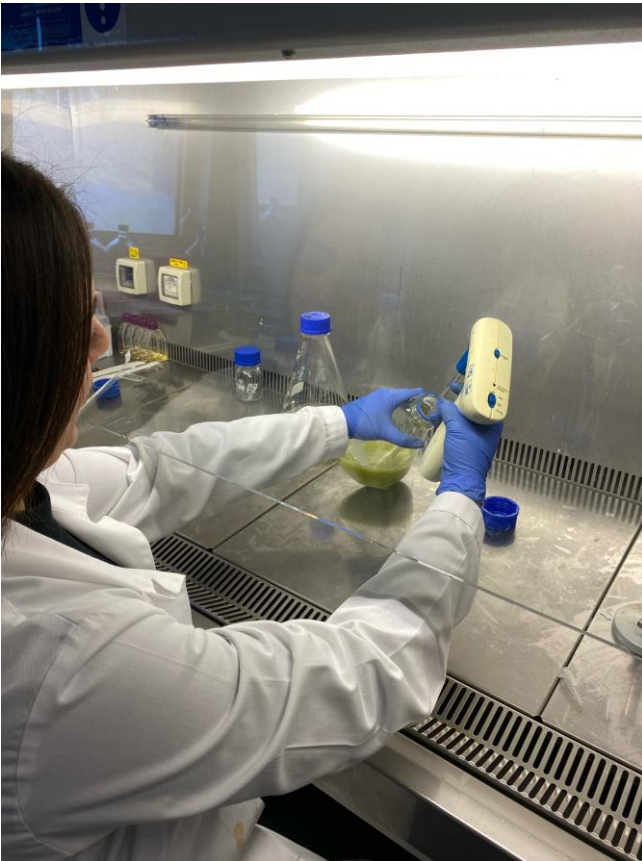


Figure 2: Sampling heterotrophic *Chlorella* in a laminar flow hood.

Microalgal culture challenges	<i>AlgaeNet4AV</i> 's approach
<ul style="list-style-type: none">• Enhancement of growth rate and target product synthesis.• Sustainable cultivation systems• Biomass pre-treatment methods• Optimization of the extraction of valuable compounds.	<ul style="list-style-type: none">• Testing different parameters of cultivation methods.• Feasibility studies in large-scale photobioreactors. Techno-economic demonstration of the viability of integrated value chains, products and applications.• Testing a variety of cell disruption methodologies (freeze/thawing, bead milling, sonication, pulse field).• Testing product purification methods (filtration, centrifugation, chromatography)

UP AND DOWNSTREAM PROCESSING

The *AlgaeNet4AV* project seeks to develop *cost-effective microalgae cultivation strategies*. For a sustainable algae cultivation system, both upstream processing (USP) and downstream processing (DSP) need to be efficiently simplified and integrated. Therefore, a well-designed and operated culture system and regular monitoring of the culture is important. The efficiency of the USP is determined by microalgal strain selection, nutrient supply (CO₂, N, and P) and culture conditions (temperature, light intensity). Whereas the constraints at the DSP level are mainly characterized by harvesting, cell disruption, and extraction/purification methods.



Figure 3: Sampling of autotrophic *Nannochloropsis* from bubble column reactors

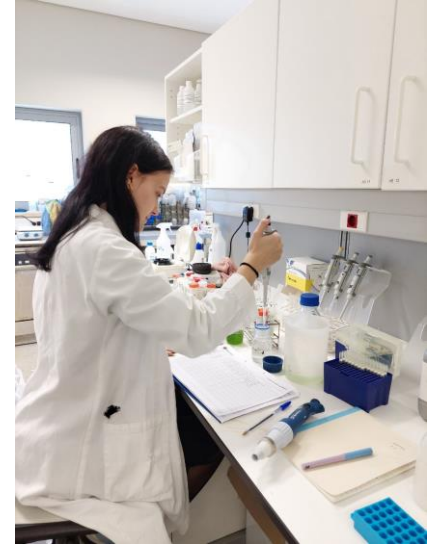


Figure 4: Monitoring of microalgal cultures

CULTIVATION OPTIMIZATION

The *AlgaeNet4AV* project focuses on the optimization of algal culture conditions. Besides the main nutrition components, photonic quality and light intensity will be studied and identified that support growth of most of the selected strains and promote the biosynthesis of selected target biomolecules. Stress conditions (temperature, salinity) will be used to induce the expression of target biomolecules. microalgae cultures will be grown in closed systems (photobioreactors) and/or in open systems (raceways and thin layer cascades). The industrial biomass production metrics and environmental conditions will be monitored, recorded and reported. The conditions showing higher productivities will be tested at the pilot-scale.



Figure 5: Bubble column reactors for larger scale cultivation (50L)



Figure 6: A: Inoculation of new cultivations, B: sampling of heterotrophic *Chlorella* for inoculation, and C: measurement of sample's dry weight.

RESULTS

The results of the *AlgaeNet4AV* project have outstanding potential to enhance performance and growth of multiple sectors in Europe including: a) sustainability of the biotechnology sector, b) augmenting Europe's manufacturing output of environmentally-friendly bio-based products, c) increasing Europe's international reputation as an innovation hub in blue biotechnology tools, and d) job creation and development of the human capital for the knowledge-based economy. Identification of novel antiviral compounds from microalgae will certainly create innovation and substantially strengthen the competitiveness of the partners. The products and the project as well as the transfer of knowledge activities that are planned within *AlgaeNet4AV* project will help to raise the competitiveness of the SMEs in the consortium, contributing directly to the EU's industrial potential. In terms of identifying new business areas that will also stimulate European economic growth, we believe that this project will afford an invaluable and exploitable link between the conventional microalgae industries and the nutraceutical/healthcare sector. We envisage opportunities for the creation of ancillary high technology businesses at the interface of the two sectors.