

NEWSletter

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“Algae production in Europe is currently limited to a few small industries, mainly for the feed, nutrition and cosmetic sectors. This sector is ripe for further expansion. However, creating an economically viable and sustainable method of growing large quantities of algae and converting them into successful commercial products that the markets accept remains a challenge.

Moreover, the commercialization of high value compounds sourced from microalgae could grow the existing industry considerably, while product innovation based on new molecular targets and clever biorefinery schemes could open new markets.

Our targets, terpenes and terpenoids from algae, are keen to respond to large, high value global market demands for natural flavourings, fragrances (terpenes and terpenoids are the main constituent of essential oils), nutraceuticals, environmentally friendly agricultural aids and preservatives.

The main achievement from ABACUS will be to tackle the biological and bioprocess challenges of oriented algal production for different terpenoids encompassing both well-established and more innovative market sectors.”



Jean-François Sassi
Project coordinator

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ABACUS, The project

KEY FEATURES

Started up in May 2017, the ABACUS project is a 3-year collaborative initiative funded by H2020 BBI JU. It gathers 2 large industries, 3 algae SMEs and 4 RTOs. It aims at a business-oriented and technology-driven development of a new algal biorefinery, thereby bringing to the market competitive and innovative algae-based ingredients for high-end applications, spanning from algal terpenes for fragrances to long-chain terpenoids (carotenoids) for nutraceuticals and cosmetic actives.

OBJECTIVES AND CHALLENGES

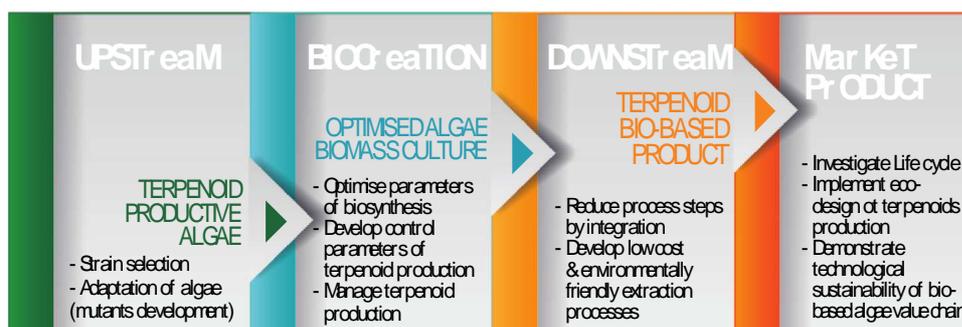
The concept of ABACUS associates several interdisciplinary approaches in order to support a high-value product market development stemming from:

- Selection and biological engineering of microalgal strains and oriented photosynthesis of terpenoids;
- Technological development of algae biomass production systems to optimize cultivation and photosynthesis of terpenoids;
- Technological development of the downstream processing steps to reduce time and costs, and to optimize environmental acceptability;
- Market development based on new algae-derived ingredients and structuration of new biobased value chains.



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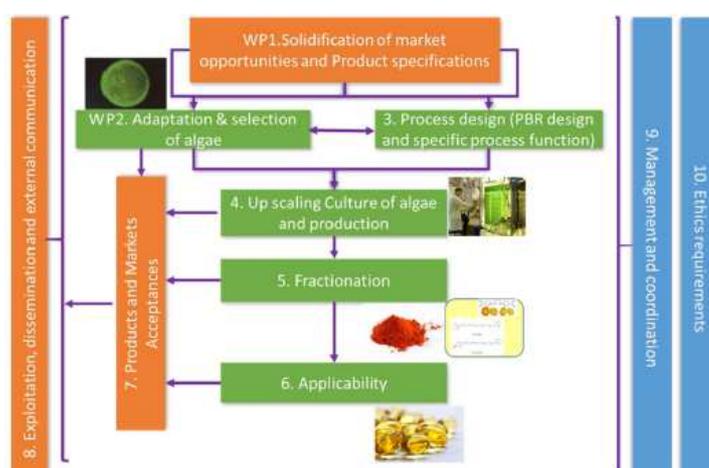
ALGAE ARE A FERTILE SOURCE OF POTENTIAL NEW NATURAL MATERIALS. ABACUS will make a major step in mastering the value chain for competitive, algae based-products.



RECENT activities

FIRST YEAR'S RESULTS

During the first year of ABACUS, relevant technical progress has been achieved in order to reach the objectives set in every workpackage. The figure below shows the different WPs and their interactions.



With the aim of identifying relevant trends and molecular targets in the carotenoids and terpenes markets, two market studies and a field market survey were performed. With the information obtained from the market studies and contributions from ABACUS partners, the **initial Roadmap** of the project was drawn within the first six months of the project, with main microalgae and cyanobacteria strains, products of interest and target markets defined.

A long list of **30 candidate microalgae/cyanobacteria species** was selected for inclusion into a screening process. In parallel, a suite of **standard methods for algal cultivation and biochemical analysis** was developed and applied in the screening (**public deliverable D2.1**). In addition, a list of methods was identified to be used to genetically engineer micro-algae and cyanobacteria within the ABACUS project.



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While screening process is completed, **pilot-scale cultivation of a preselection of 7 algae strains** is now on-going. Main activities focused on scale-up of cultures, culture media optimization, water treatment and recycling, and photobioreactor (PBR) improvements in order to reduce maintenance and operational costs. Also, **microfluidic optical density sensor** prototype and NO_3^- and NH_4^+ **electrochemical sensors** were developed, and a prototype was built for pre-concentration of gaseous samples for **hemi-terpenes detection with on chip gas-chromatography**.

Upscaling culture and production activities started earlier than scheduled and delivered a selection and distribution of the most promising scenarii for large scale cultivation by ABACUS partners. A testbed of two 180L Subitec Flat Panel Airlift (FPA) reactors was installed and commissioned at CEA Cadarache, and trial runs were performed.



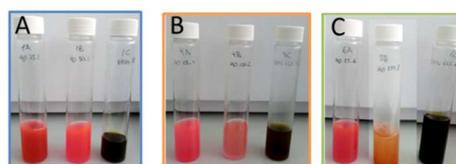
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First scale-up results were obtained with *D. salina* for **β -carotene production at pilot scale facilities** in different large PBR systems (green wall panels and cascade raceway at A4F, Portugal). Furthermore, the first hundreds grams of algal biomass were produced and provided for testing fractionation processes at CSIC.



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Fractionation activities focused on the development of green extraction procedures employing innovative compressed fluids (PLE, GXs, SFE), and fractionation/purification procedures based on supercritical fluids, including also drying and/or particle formation. Also, advanced green processes have been explored with the aim of performing wet biomass extraction to obtain increased yield and purity in valuable carotenoids. The combination of unit operations to generate **integrated processes with multiple product outputs** was considered and the fractions/extracts produced were characterized.



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Find us at:

- **Sea Tech Week**
8-12 October 2018
Brest, France
- **Algae Biomass Summit**
14-17 October 2018
The Woodlands, Texas, USA
- **AlgaEurope**
4-6 December 2018,
Amsterdam, Netherlands



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