

Conference Topic: 1.4

ABACUS – PILOT SCALE MICROALGAE CULTIVATION TARGETING THE PRODUCTION OF COMMERCIAL TERPENOIDS

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ABACUS is a 3-year project funded by the H2020-BBI-JU (www.abacus-bbi.eu) aiming at development of algal biorefinery, with focus on high added-value terpenes for fragrances nutraceuticals and cosmetics. A4F deployed pilot open and closed photobioreactor (PBR) technologies for microalgae production. A4F's goal is to achieve long-term culture control and high productivities of final products.

Dunaliella salina, *Nannochloropsis oceanica* and *Tisochrysis lutea* were selected for production of β -carotene, vaucherixanthin and fucoxanthin, respectively. β -Carotene is a naturally-occurring retinol precursor with extensive health benefits. *D. salina* is the richest known natural source of β -carotene. *D. salina* production in carotenogenic phase was achieved in semi-continuous regime for over 150 days in an open cascade raceway. A maximum areal productivity of $2.5 \text{ g}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$ of biomass and of $101.6 \text{ mg}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$ of carotenoids were attained so far. Maximal carotenoid composition was 6.6% (m/m).

Vaucherixanthin is an interesting carotenoid albeit less known than fucoxanthin. Fucoxanthin shows high antioxidant, anti-obesity, antidiabetic, anti-inflammatory, anticancer, antiangiogenic and hepatoprotective activities. *N. oceanica* was grown in closed tubular PBRs within a greenhouse. It reached an average photosynthetic biomass productivity of $7.11 \text{ g}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$. CSIC has tested the pilot carotenoid extraction from biomass by A4F and obtained so far an extract containing 11.5 % (m/m) of total carotenoids.

The marine Haptophyta *T. lutea* has also been grown in flat panel PBRs (Green Wall Panels™) for the production of fucoxanthin. A maximum areal biomass productivity of $7.27 \text{ g}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$ was achieved at A4F at the end of Winter. Fucoxanthin extraction and quantification is currently under way.