

Cultivation of *Botryococcus braunii* Showa in Annular Columns and Green Wall Panel reactors up to 1400 L

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Abstract:

Botryococcus braunii is a colonial green alga that is classified in different races (A, B, L) on the basis of the main hydrocarbon produced. This alga is attracting much interest mainly because of its ability to produce and release hydrocarbons of great value for biofuels, although it can also produce other biotechnologically relevant molecules, like other lipids and exopolysaccharides. The main problem with commercial exploitation of this alga is its low productivity.

In this work *B. braunii* Showa (B race) was cultivated both indoors and outdoors. Indoors, cultivation was performed in 60-L annular columns, reaching maximum biomass productivities of about 110 mg L⁻¹ day⁻¹. The culture produced in the columns was used to inoculate 40-L GWP®-III reactors, which were operated outdoors. In this system biomass productivities attained values up to 210 mg L⁻¹ day⁻¹. The cultures obtained here were used to inoculate a 1400-L GWP®-II reactor. Maximum biomass productivities in this large pilot outdoors were about 140 mg L⁻¹ day⁻¹. Hydrocarbon production and yields will be illustrated.

The 40-L GWP® reactor was also used to produce inoculum for two 1-m² raceway ponds, one of which was maintained under nutrient replete conditions and the other under nitrogen starvation. Biomass productivities were slightly higher under nutrient replete conditions, with maximum values of 160 compared to 140 mg L⁻¹ day⁻¹ under N starvation. Effects on hydrocarbon production of nitrogen starvation will be presented.

The main issues during cultivation were sensitivity to high light, to low temperature and to contamination.

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Keywords:

Botryococcus braunii, hydrocarbon, biofuels, pilot scale, Green Wall Panel

CONFERENCE PROGRAM, DAY 2- WEDNESDAY, 4 DECEMBER 2019

08.00-8.30		Registration / welcome coffee
8.30-8.35		Opening Session
8.35-9.00		Keynote Lecture : Ranibar Reza, Group Leader-Fermentatio, CPI, UK <i>Heterotrophic cultivation of microalgae at industrial scale- market study, opportunities, challenges and new trends</i>
9.00-10.30		Session 5: Developments, Process Chair: Hywel Griffith, Chief Scientist, Fermentalg, FR
9.00-9.15	5.1	Jean Francois Sassi, Group Manager – Algae Processes and Technologies, CEA, FR <i>Online monitoring of photobioreactors: development & integration of innovative sensors for optimal process and product control</i>
9.15-9.30	5.2	Iris Haberkorn, Doctoral candidate, ETH Zurich, CH <i>Optimization of microalgae upstream performance by nanosecond pulsed electric field processing</i>
9.30-9.45	5.3	Olivier Bernard, Senior Researcher, Inria, FR <i>Worldwide potential of microalgal rotating biofilms</i>
9.45-10.00	5.4	Gabriel Acien, Professor Chemical Engineering, University of Almeria, ES <i>Challenges on the optimization of thin-layer reactors for the large scale production of microalgae</i>
10.00-10.15	5.5	Henrik Hjelmssmark, Director and Founder, SANI Membranes, DK <i>Vibro MF and UF Filtration for Algae Harvest, Concentration and Refinery</i>
10.15-10.30	5.6	Jeremy Pruvost, Professo, GEPEA / University of Nantes, FR <i>Advanced monitoring for the real-time optimization of microalgae solar culture systems</i>
10.30-11.00		Coffee Break / poster / trade show
11.00-12.45		Session 5: Developments, Process Chair: Jean Francois Sassi, Group Manager - Algae Processes and Technologies, CEA, FR
11.00-11.15	5.7	Gao Fengzheng, PhD, Wageningen University, NL <i>Fucoxanthin production and monitoring at pilot scale</i>
11.15-11.30	5.8	Fabrizio Di Caprio, Postdoctoral Researcher, University Sapienza of Rome, IT <i>Control of bacteria growth in heterotrophic microalgae cultures by uncoupled nutrients feeding</i>
11.30-11.45	5.9	Christelle Crampon, Associate Professor, Aix-Marseille Université, FR <i>Neutral lipid recovery using supercritical CO2 fractionation applied to microalgae suspension</i>
11.45-12.00	5.10	Natascia Biondi, University of Florence, IT <i>Cultivation of Botryococcus braunii Showa in Annular Columns and Green Wall Panel reactors up to 1400 L</i>
12.00-12.15	5.11	Fabian Abiusi, PhD candidate, Wageningen University and Research, NL <i>Oxygen balanced mixotrophic growth of acidophilic microalgae</i>



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