Preliminary evaluation of a scalable method for TAG extraction from Nannochloropsis sp.

PRELIMINARY EVALUATION OF A SCALABLE METHOD FOR TAG EXTRACTION FROM *NANNOCHLOROPSIS* SP.

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Recently, several studies have been reported for the optimization of large-scale production of biodiesel from microalgae. In particular, drying and extraction of the biomass represent a critical choice for industrial productions.

Aim of this work was the selection of an efficient methodology, suitable for scaled-up production of triacylglycerides (TAG) from microalgal biomass. Extraction tests were performed with *Nannochloropsis* F&M-M24, grown at different nitrogen regimes, in order to produce biomass with different contents of oil. We first compared two cell's disruption methodologies: glass microspheres, commonly used with algae biomass, and microwaves (MW), already used in industrial applications. The two methods resulted comparable in terms of total lipid extracted (% dry weight) regardless the biomass lipid content. A MW/Soxhlet combined protocol was then applied to optimize yield and increase selectivity in TAG extraction. Preliminary MW cell's disruption was performed with biomass blended in distilled water allowing at the same time the separation of water soluble compounds. Petroleum ether, chloroform and diethyl ether were then compared as solvents for the Soxhlet extraction of the biomass. Extraction yields were estimated by weight and by a spectrophotometric measurement (Marsh and Weinstein, 1966). Extract purity was instead evaluated by 1H-NMR and FT-IR analysis. On the basis of these data, chloroform resulted the solvent with the highest yield in term of total extraction (31% as w/w) with an oil "poor" biomass, but petroleum ether, even with a lower yield (11% w/w), was preferred due to its better selectivity for TAG. Then, petroleum ether was selected for Soxhlet extraction and used with both low and oil rich biomasses, with or without preliminary MW treatment. The best result (29.5% as w/w TAG yield on a 55% total lipid content) was obtained using a lipid-rich biomass and MW/Soxhlet combined protocol. The 1H-NMR analysis of the extracted oil revealed the presence of TAG with high purity and low amounts of other fatty acids derivatives. The MW/Soxhlet combined system shows potential for the extraction of high purity oil from *Nannochloropsis biomass* at industrial scale. Extraction processes will be further improved in order to recover other high value molecules for commercial exploitation.

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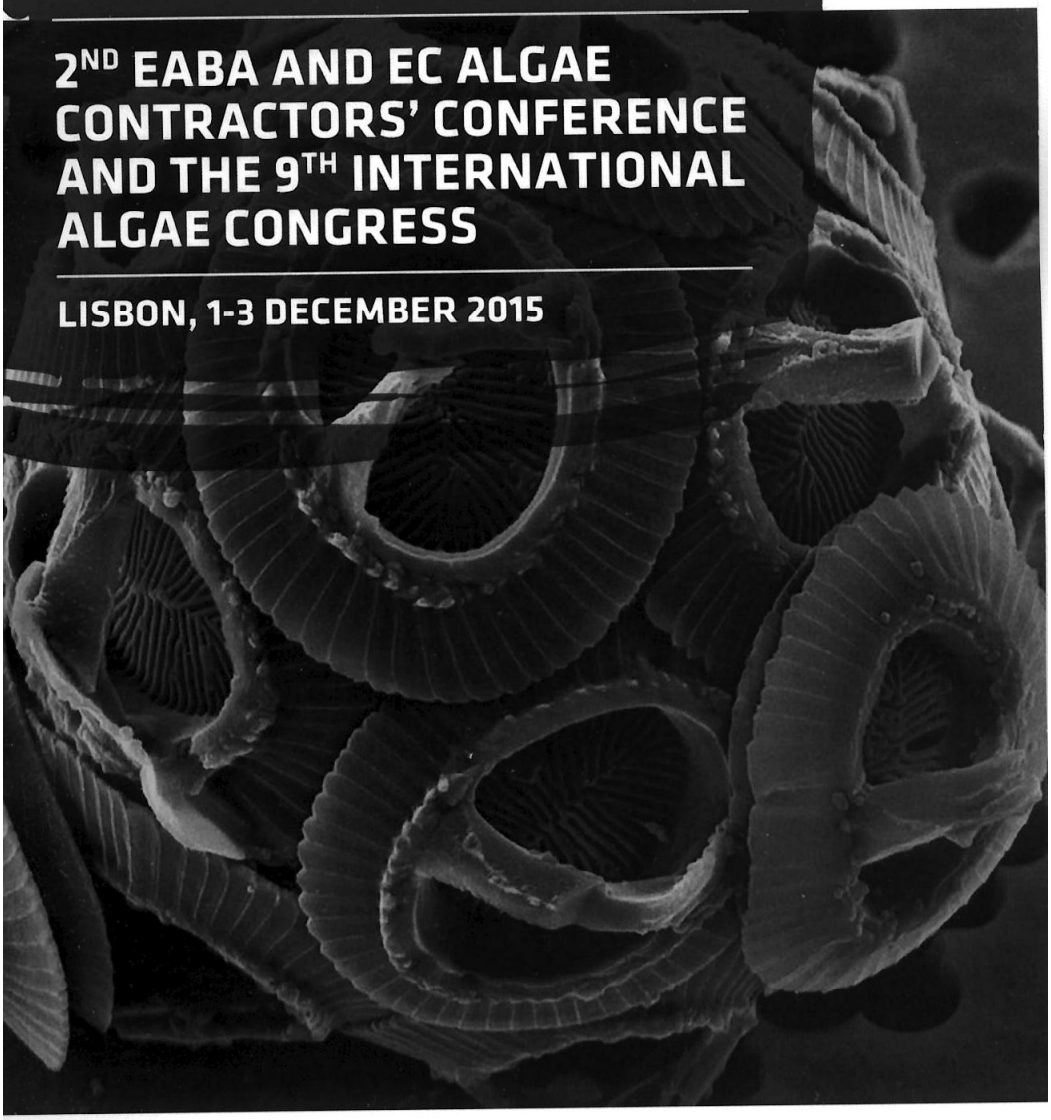

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