
Impact of the process and the extraction method on lipids extraction from microalgae

JURY V. (1), PAINTEAUX B. (1), CHEMARIN F. (1), GUYON C. (1), GRUA-PRIOL J. (1)

¹ Oniris-GEPEA, Nantes, France

The agri-food industry has to face new challenges in response to current societal expectations: producing high quality food (nutritional, organoleptic, sanitary, etc.) while respecting the environment. In addition, it must introduce new sources of protein in order to feed the planet (9 billion people in 2050) and to reduce the quantity of animal proteins in products. Microalgae are promising bioresources with interesting nutritional potential. Indeed, these raw materials have protein contents of between 14 and 77% with high digestibility values and interesting amino acid profiles. They also have high lipid contents with a high proportion of polyunsaturated fatty acids (including ω 3 and ω 6). The development of sustainable transformation processes for this bioresource is a real challenge, in order to obtain different fractions (lipid and protein) with interesting properties for the transformation into finished products.

The aim of this work is to study the impact of the pre-treatment before the lipid extraction from *Chlorella Vulgaris*. Four processes were considered: atomisation, freeze-drying, atomisation coupled with grinding, freeze-drying coupled with grinding. Three lipid extraction methods were applied on each process material: i) by solvent (chloroform and methanol), ii) by Accelerated Solvent Extraction (dichloromethane and methanol), iii) by supercritical CO₂. Impact of these processes and extraction methods on fraction obtained was characterized by measuring the extraction efficiency, the pigment and lipid content of the extractives and by identifying the fatty acids by gas chromatography.

Results show that the pre-treatments undergone by the biomass do not affect the extracted fatty acid profiles but do affect the yield. The best yields are obtained when the biomass is ground. Supercritical CO₂ extraction has a lower yield than the other two extraction methods. However, it is extremely selective on the extracted compounds by allowing the extraction of 75% of the neutral lipids under the implemented conditions.