# Integrated process conception to produce a soluble protein extract from Tetraselmis chui with low color for food application

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Microalgae constitute an interesting source of proteins for the food industry thanks to a high protein content, a balanced amino acid content and a high surface productivity. It can be consumed raw but several aspects are hindering their consumption such as low digestibility as well as strong color induced by the chlorophyll and taste. These problems can be solved by a biorefinery process, usually consisting of a protein extraction followed by purification.
The present work, part of the PROFUTURE European program, aimed at enhancing the protein recovery from Tetraselmis. The general process applied consists of cell disruption, with freeze-thawing or bead milling, centrifugation and purification with ultrafiltration or isoelectric precipitation.
A protein yield of 8% has been obtained after a simple thawing and centrifugation, with a low colored supernatant whereas a low soluble protein extract, with a green color, has been obtained by bead milling and centrifugation, with a mass yield of 12% of total proteins. The 4% gain with bead milling in comparison to thawing might not be sufficient to justify bead milling based on cost and environmental reasons. Hence, the supernatant from the thawed biomass has been concentrated and purified with two techniques: isoelectric precipitation (IEP), a conventional technique, and membrane filtration, being environmentally friendlier and softer. The isoelectric precipitation was not effective for the precipitation of Tetraselmis proteins. Membrane filtration, using 10 kDa membranes, was able to retain and purify supernatant proteins with a recovery yield up to 86% on this operation unit. A scale up has been applied on the final process, with the treatment of 10 kg of dry matter, and the purified proteins showed interesting foaming properties for a future valorization. However, there is still a need to deeply understand the physico-chemical interactions of the proteins, within the microalgae extracts and along the process, which limit the global yield and the industrial development.