

PhD: Food Science

Title: Valorization of algal biomass using enzymatic biotechnology for the development of new food products

Supervisor: Prof Prospero Di Pierro

Objectives of the research project and interdisciplinary collaborations:

Algae biomass is considered a new sustainable source of both macronutrients such as proteins, lipids and carbohydrates but also of active secondary compounds. In the European Green Deal, algae are reported as a virtuous model of "innovative food and feed products" as part of the Farm to Fork strategy. Compared to terrestrial crops, algae have numerous advantages including rapid growth, a high carbon fixation capacity, a greater protein yield per unit of surface area and low water consumption per unit of production. Despite these advantages, for many of the micro and macroalgae, the downstream processes for obtaining the protein and lipid fractions and some of the active compounds are still not very efficient in industrial practices except for a few exceptions.

Most species grown or collected from the wild are rich in nutrients. However, the presence of a very resistant cell wall reduces its bio-accessibility in direct consumption and makes them difficult in the extraction processes of biomolecules with high added value.

The development of efficient and sustainable methods and technologies for the extraction of these biomasses could contribute significantly to the development of the sector by increasing the potential uses of the enriched fractions and therefore stimulating the primary production of these sustainable biomasses.

Enzyme-assisted extraction technologies are emerging among the most promising green extraction methodologies in the food industry due to their ability to minimize waste, energy consumption and processing times. Furthermore, they are fundamental for reducing health risks and pollution caused by using toxic organic solvents.

The main objectives of this project are:

- 1) Development of enzymatic disassembly techniques for algal biomass to obtain enriched protein, lipid and carbohydrate fractions.
- 2) Study of the techno-functional properties of the isolated fractions.
- 3) Development of new functionalized foods using isolated fractions of algal biomass.

Interdisciplinary collaborations (BIO/10, BIO/03, AGR/15, CHIM/01, AGR13) are present at the Departments of Agriculture, Chemical Sciences, Biology and at the Center for Food Innovation and Development in the Food Industry (CAISIAL) of UNINA

Innovation and originality of the project in relation to the state of the art:

The elements of innovation and originality of this project are represented by the development of processes with low environmental impact such as enzymatic biotechnologies and the recovery of compounds with high added value from algal biomass to be used as ingredients in the development of new food products.

Grant availability

PNRR -AGRITEC funds (€54k), Agreements, (€90k)

Collaborations with foreign institutions

Prof. Carlos Regalado, Biotechnology Park, UAQ (Mexico). Prof. Vito Verardo, Department of Nutrition and Food Science, University of Granada (Spain). Prof Olga Martin-Belloso of the Department of Food Technologies - University of Lleida (Spain).