ALGAL CULTIVATION, CHARACTERIZATION AND PROCESSING TECHNIQUES

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Figure 1 - Dr. Matos specialist in algae biotechnology
Source: Authors

Microalgae are a group of microscopic and photosynthetic organisms present in both marine and freshwater environments. They are able to accumulate biomass by converting solar energy, CO2, and nutrients into biomass. Furthermore, microalgal biomass is a promising feedstock for generating sustainable products such as for food, feed, fine chemicals and biofuels.

Microalgae are exceptional producers of a wide range of bioproducts with medium- to high-value market price such as β-1,3-glucan polysaccharide, single-cell-protein, carotenoids and phycobilin pigments and long chain polyunsaturated fatty acids that are commercialized in the food industry as dietary supplements and functional foods, in the pharmaceutical and chemical industries as flavorants and cosmaceuticals, and in the therapeutic field as nutraceutical compounds.

My thesis is composed of eight chapters and it begins with an introduction of algae biotechnology based on literature review (**Chapter 1**).

Chapter 2 reviews the main existing and potential high-value products that can be derived from microalgae with a particular focus in food science and technology. Further details can be found in *Journal of the American Oil Chemists' Society (JAOCS, v. 94, p. 1333-1350, 2017).*

Chapter 3 highlights the current state-of-art of using desalination concentrate for algal cultivation in Brazil. This review article was published in *Algal Research (v. 24, p. 505-508, 2017).*

One of the key attractions of microalgae is the high lipid content and fatty acid composition found in several microalgae species, and these metabolites can be manipulated through growth conditions (**Chapter 4 and 5**). These chapters were published as an original research articles in *Bioresource Technology (v. 197, p. 48-55, 2015 and v. 224, p. 490-497, 2017),* and both chapters had the overarching aim to investigate the manipulation of marine algae *Nannochloropsis gaditana* cultured in desalination concentrate in order to maximize lipid productivity.

Chapter 6 was developed in collaboration with Dr. Rafael Feller from the Department of Chemical Engineering (UFSC), and had the objective to evaluate the biochemical composition of six microalgae for food utility application. This chapter was published as an original article in *JAOCS (v. 93, p. 963-972, 2016)*. Moreover, part of this work was presented at AOCS 106th Annual Meeting & Industry Showcases in Orlando - Florida, United States, in 2015.

Chapter 7 describes the correlation of algal biochemical components through principal component analysis (PCA) of six microalgae. This topic was published in *Inform Magazine of AOCS: International News on Fats, Oils and Materials (v. 27, p. 22-26, 2016).*

Chapter 8 covers the investigation of using non-thermal plasma (NTP) on *N. gaditana* biomass, lipid content and fatty acid compositions. This work was conducted in partnership with researchers from the University of São Paulo (USP) and the South University of Santa Catarina (UNISUL). The results of this study were published in *Brazilian Journal of Chemical Engineering (v. 36, p. 1419-1428, 2019).*

In summary, the research has demonstrated the feasibility of growing microalgae in desalination concentrate (DC), determined the chemical composition of microalgae biomass for food application and evaluated the effect of NTP on algal biomass for potential biodiesel production.

On 13 November 2018, the Brazilian Education System (CAPES) announced that my thesis was awarded with an honorable mention on **Best Thesis Award 2018** in the category of Food Science, emphasizing the outstanding research conducted during the PhD candidature.