Francesco Gentili research

Algae for nutrients recycling and biomass production

Research is an amazing tool that society has to answer and to solve questions and problems. During the last few decades there has been a constantly increasing demand of sustainability from the society. To reach environmental sustainability, fighting climate change and improving resources use we need to recycle as much as possible. Carbon, nitrogen and phosphorus are the most important elements for any leaving organisms; however, the way we recycle these vital elements is still limited. Even though microorganisms, terrestrial and aquatic plants are fantastic recyclers we still do not use them in the best possible way; especially we do not fully understand how they work from a physiological and ecological point of view. During my scientific career I have been studying the effects and the interaction between nitrogen and phosphorus on the physiology of different microorganisms.

During the last decade I have been focusing on the use of green microalgae for nitrogen and phosphorus removal from municipal and industrial wastewater together with CO2 fixation from flue gases. The idea is to recycle carbon, nitrogen and phosphorus removing different sources of pollutants and at the same time producing biomass for the generation of bioenergy and biomaterials.

I have been performing studies both in the laboratory under control conditions and at the algae growing facilities built in close collaboration with the industrial partners Umeå Energi (combined heat and power plant) and Vakin (wastewater treatment plant).

Another important scientific topic has been the effects of abiotic factors such as nutrients and salt stress on the regulation of algal lipid production in different algal strains.

Part of my studies have been focusing on the development and set up of a simple, fast and reliable methods for the quantification of algal lipid production.

However, the main goal of my research is the recycle of nutrients and the removal of pollutants from different type of wastewater and flue gases together with the production of a useful biomass to be used as source of biofuels and biomaterials.