The greenest energy there is in AquaFarm

The goal of microalgae as an energy source: the research and innovative projects in AquaFarm in Pordenone Fiere on 26th and 27th January, with a warning that the results are essential far beyond fuel sector.

Milano / Pordenone 16th January, 2017. This year marks the 57th anniversary of the idea to draw energy from algae. Indeed, it was 1960 when the article by Oswald and Golueke "The Biological Transformation of Solar Energy" was released, which dealt with the controlled use of algal photosynthesis to produce biomass, from which to derive methane. Over the decades, research has pursued this and other strands, focusing, in the mid-90s, on the cultivation of algae to extract the oil they produce to store energy.

After being extracted – a process far from easy - the oil is subjected to various treatments according to the objectives we aim towards: if we transesterificate it with methylene, we produce so-called biodiesel; if instead we idrogenificate it, we produce HVO (Hydrotreated Vegetable Oil), which can be used in diesel engines and in turbines for aeronautical use. All processes involved are by now mature. For example, the hydrogenation of low-quality fat compounds or hydrocarbons to obtain high-grade fuels dates back to 1913 and granted the inventor, the German chemist Friedrich Bergius, the Nobel prize in 1931. The problem is the cost, and in particular that of algal oil. There are different estimates of how much a liter of oil from algae costs now. All estimates, however, declare that the cost must drop at least ten times to make the product competitive compared to fossil fuels.

Today, research and experimentation focuses on four areas. The first is the effort to optimize the production, extraction and refining processes. The second is the selection of algal species with characteristics allowing the improvement of algae production through selective cultivation. For example, algae with a much lower number of photoreceptors for photosynthesis are trying to be obtained, to prevent the drastic lowering of the yield of photosynthesis in the presence of a lot of light.

A third approach involves changing the algal genome by inserting or deleting genes with the aim of producing specific variants with desired traits. The most radical approach is pursued by laboratories and companies active in the synthetic genetics, with which new organisms are created from scratch by assembling new genomes. And precisely in biofuels the most ambitious project of its kind has been ongoing since 2009. Exxon-Mobil finances Craig Venter (the decoder of the human genome), his research institute and his company, Synthetic Genomics Inc., to create entirely new species of alga optimized for the production of oil. A fourth branch, finally, seeks to exploit the natural physiological responses of algae to induce them to helpful behaviors. For example, we have known for a long time that algae multiply enormously under stress, or die on a massive scale, or produce and / or secrete substances. Finding a method to stress, or rather stimulate, the algae in a targeted manner can lead them to useful reactions for humans and even not harmful to algae themselves.

In the **Algochemistry** session: **applications in the energy field, in waste treatment, and beyond**, in the second AquaFarm day the results of three projects which can be included, to greater or lesser extent, in the strands described above will be presented. The FUEL4ME project, funded under the Seventh Framework Programme (FP7) of the EU and introduced by Dorinde Kleinegris, coordinator of the project, aims to optimize the algae oil production, extracting and refining processes, making it a continuous process as much as possible, to reduce its costs. Professor Kleinegris will present the results achieved until today, also with the contribution of Italian companies and universities. The project BIOFAT, also funded dall'FP7, will be presented by Natascia Biondi, from University of Florence, and aims to select high-productivity strains to produce with highly optimized processes, and scale the system from the experimental to commercial level (10 hectares of surface). Finally, the brand new PHOTOFUEL, funded under Horizon2020, aims to transfer a plant gene, and to modify or inhibit the expression of others naturally present in some species of green and blue-green algae (cyanobacteria), enabling them to produce hydrocarbons or precursors of the same, and especially to expel them when suitably stimulated (stress). In practice, we want to transform

the algae and cyanobacteria into biocatalysts, mini chemical plants with a continuous cycle, which must not be collected (for this would kill them) and "squeezed" to obtain oil, which must then be chemically treated to be used as

fuel. In this way, we aim to increase the production of useful materials without increasing that of biomass and to reduce the costs of extraction and processing. The project, also presented by Natascia Biondi, will end in 2020 and is carried out by an academic-industrial group that also includes Italian universities (Florence), chemical companies (such as Neste Oil, Finnish, one of the pioneers in HVO) and car companies (Volvo, Volkswagen, CRF).

This research on algae for fuel production has value for the whole industry, and also for the future of humanity: if the aimed increase of productivity and reduction of costs will be achieved, it will obtain even greater successes in other fields, first of all the food one. We will be back on this subject.

The AquaFarm 2017 conference program is available and constantly updated on the Program section of www.aquafarm.show Web Site. Participation is free. This is the link to the online pre-accreditation. It will however be possible to register during the event.

For more information
Aurora Marin and Marco Comelli
Studio Comelli
Press office & Content management
press@studiocomelli.eu
02 22228345