Second Generation Biodiesel from *Rhodotorula graminis*. Lipids Biosynthesis and Lipidome Characterization

Cucchetti D, Bianchi D., Bortolo R., Franzosi G, Fiorani T., Chiaberge S, Esposito A.
eni s.p.a., Research center for non Conventional Energy – Istitute eni-Donegani, Novara (Italy)

In recent years, industrial fermentation studies have been focused on processes for biofuels production that can move the market dependence away from fossil based energy sources. In order to avoid the competition with food crops, process studies have moved from the first generation to the so called second generation biofuels, that would be manufactured from agricultural and forestry residues and from lignocellulosic non-food energy crops.

Sugars obtained from lignocellulosic feedstock are a good carbon source for oleaginous microorganisms, that can produce lipids definitely comparable to vegetable oils, thus suggesting their use in fermentation processes for the production of second generation biodiesel The yeast *Rhodotorula graminis* is known for its ability to accumulate large amounts of intracellular lipids, which may achieve up to the 70% of the total cellular dry weight.

In this study, experiments were carried out using undetoxified corn stover hydrolysate as substrate showed that the strain *Rhodotorula graminis* DBVPG 4620 could be a good candidate for converting renewable feedstock into lipids, being able of growing on different carbon sources, like lignocellulose-derived C6 and C5 sugars, and fairly resistant to some of the most representative inhibitors generated during the hydrolysis of lignocellulosic biomasses (i.e. furfural, HMF, acetic acid).

In addiction, the lipidome of *Rhodotorula graminis* has been built combining different mass spectrometry analysis: GC-MS, DCI and ESI FTICR MS.

The study of lipidomics, with proteomics or metabolomics, allows to have a complete overview about metabolic patterns of a specific microorganism and it can become an important means to optimize the biofuel production process.