Biofuels and high value added products from the yeast *Rhodosporidium toruloides* NCYC 921:

Strategies towards a true cost-effective and environmentally sustainable integrated multiproduct driven biorefinery.

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Single-cell oils (SCO) have been considered a promising source of 3rd generation biofuels mainly in the final form of biodiesel. However, its high production costs have been a barrier towards the commercialization of this commodity. The fast growing yeast *Rhodosporidium toruloides* NCYC 921 has been widely reported as a potential SCO producing yeast. In addition to its well-known high lipid content (that can be converted into biodiesel), is rich in high value added products such as carotenoids with commercial interest. The process design and integration may contribute to reduce the overall cost of biofuels and carotenoid production and is a mandatory step towards their commercialization.
The present work addresses the biomass disruption, extraction, fractionation and recovery of products with special emphasis on high added valued carotenoids (beta-carotene, torulene, torularhodin) and fatty acids directed to biodiesel. The chemical structure of torularhodin with a terminal carboxylic group imposes an additional extra challenge in what concern its separation from fatty acids. The proposed feedstock is fresh biomass pellet obtained directly by centrifugation from a 5L fed-batch fermentation culture broth. The use of a wet instead of lyophilised biomass feedstock is a way to decrease processing energy costs and reduce downstream processing time. These results will contribute for a detailed process design. Gathered data will be of crucial importance for a further study on Life-Cycle Assessment (LCA).

Sponsor: FCOMP-01-0124-FEDER-019317 (ex-PTDC/AAC-AMB/116594/2010 entitled "CAROFUEL - New process for a sustainable microbial biodiesel production: The yeast Rhodotorula glutinis biorefinery as a source of biodiesel, biogas and carotenoids" supported by FCT (Fundação para a Ciência e a Tecnologia) (also supported by FEDER funding through COMPETE – Programa Operacional Factores de Competitividade).