

## Sustainable production of microbial oils and extraction with green solvents

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### Abstract:

The agricultural sector is one of the leading producers of agro-industrial solid waste. This waste is mainly disposed of incineration or landfill, representing a huge loss of potential resources to produce high-value chemicals. In the framework of the Agro2Circular (A2C, <https://agro2circular.eu/>) EU project, we developed a fermentation process for the production of microbial oil destined to the cosmetic industry, using waste lemon extract as starting material. Lemon extract is an aqueous side stream derived from the extraction of polyphenols from waste lemon peel and pulp from the juice industry. The oleaginous yeast *Cutaneotrichosporon oleaginosum* was grown on different lemon extract-based media intended to optimize growth and lipid production; a scale-up to 2 L bioreactors allowed to reduce process time compared to multi-well scale and resulted in a lipid accumulation of  $47.03\% \pm 7.9\%$  ( $\text{g}_{\text{oil}} \text{g}_{\text{CDW}}^{-1}$ ). We set ourselves the goal to develop a greener and safer downstream method for oil extraction from cellular biomass, finding a valid alternative to the traditional Folch method, which exploits toxic compounds such as methanol and chloroform. With some ASTROBIO™ green solvents, we extracted and purified 11.29 g of oils with an extraction efficiency of  $79\% \pm 4.49\%$  compared to the Folch method. The best results were obtained processing wet biomass, avoiding the desiccation step of the cells, which is promising in terms of energy and time savings for large scale applications and the development of a more sustainable process.