

High-quality biodiesel production from *Yarrowia lipolytica* NCYC 2904 bio-oil

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Due to the global increase in energy demands, the depletion of fossil fuel reserves, and the increase in environmental pollution, upsurges the need to create renewable and environmentally friendly energy. Biodiesel, one of the most attractive alternatives for the replacement of conventional fossil fuels, can be produced from bio-oil accumulated by oleaginous yeast. The use of low-cost feedstocks for bio-oil production contributes to reducing global costs and enables the development of more sustainable processes. Thus, bio-oil production by *Yarrowia lipolytica* NCYC 2904 from crude glycerol (a by-product of the biodiesel industry) and volatile fatty acids (intermediates in the anaerobic fermentation of food wastes) was studied in a lab-scale stirred tank bioreactor using fed-batch and two-stage batch operation modes. The fed-batch culture with a crude glycerol feeding rate of 3.12 mL·h⁻¹, followed by the addition of 18 g·L⁻¹ VFAs mixture, was the best strategy to obtain the highest bio-oil production (6.1 g·L⁻¹). Bio-oil of *Y. lipolytica*, rich in oleic acid, was successfully converted into biodiesel, which meets the criteria of the international biodiesel standards EN 14214 and is similar to biodiesel produced from vegetable oils. This demonstrates the potential of *Y. lipolytica* to convert low-cost substrates into feedstocks for high-quality biodiesel production, according to the biorefinery and bioeconomy circular guidelines.

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