Yarrowia lipolytica is a promising oleaginous yeast for bio-oils production from volatile fatty acids

Ana S. Pereira, Sílvia M. Miranda, Isabel Belo, Marlene Lopes
Centre of Biological Engineering, University of Minho, Braga, Portugal

Every year, approximately 931 million tons of food waste (FW) are generated worldwide. The discharge of FW in the landfill has a negative environmental impact due to water and soil pollution and GHG emission. Volatile fatty acids (VFAs), produced by anaerobic fermentation of FW, can be used as a substrate by oleaginous yeasts to produce bio-oils.
The bioconversion of pure VFAs into Y. lipolytica biomass and bio-oils was affected by oxygenation conditions in batch cultures carried out in a stirred-tank bioreactor. Approximately 3-fold enhancement in lipids concentration was obtained by increasing the agitation and aeration rates. Two-stage batch cultures (1st stage – growth in glucose; 2nd stage – bio-oils production in VFAs) proved to be an effective approach to improve lipids accumulation from pure VFAs. The highest lipid content was attained in conditions of dissolved oxygen concentration of 45% of saturation during the lipogenic phase. Y. lipolytica also accumulated lipids in food waste-derived VFAs, particularly in two-stage batch cultures (1st stage – growth in VFAs; 2nd stage – bio-oils production in crude glycerol). These bio-oils are promising feedstock for the biodiesel industry and the estimated fuel properties of biodiesel are in accordance with international standards.

Keywords: *Yarrowia lipolytica*, volatile fatty acids, bio-oils, biodiesel

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Presenter	:	Marlene Lopes (marlenelopes@deb.uminho.pt)

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