Biotechnological valorization of waste cooking oils: lipase and microbial lipids production by *Yarrowia lipolytica*

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Waste cooking oils (WCO) generated from vegetable oils used at high temperatures in food frying, cause environmental problems and must be reutilized. New strategies to valorize these wastes are attracting a great scientific interest due to the important advantages offered from an economic and environmental point of view. A microbial platform can be established to convert low-value hydrophobic substrates, such as waste cooking oils, to microbial lipids (single cell oil, SCO) and other value-added bioproducts, such as lipase.

In this work, an experimental design based on Taguchi method was applied to evaluate the effect of several parameters (pH, WCO concentration and Arabic gum concentration) on lipase and microbial lipids production by *Y. lipolytica* W29, aiming to define the optimum conditions for lipase and SCO production in batch cultures.

Initial pH was the factor with more influence both in lipase (87%) and microbial lipids production (47%). In the experiments carried out at pH 7.2, a 4-fold improvement in maximum lipase production was observed, compared to the experiments performed at pH 5.6. The optimal conditions for lipase production were also validated with olive oil, and the lipase production was lower than that obtained with WCO. This result demonstrates the possibility of using WCO, instead of olive oil, as lipase inducer in *Y. lipolytica* W29 cultures.

Lipid accumulation by *Y. lipolytica* W29 growing on WCO ranged from 27% (w/w) to 53 % (w/w), depending on the medium composition. This confirms the great potential of *Y. lipolytica* to accumulate lipids more than 20% of cell dry matter, being therefore considered an oleaginous yeast. Moreover, it was proved that WCO is a suitable and alternative carbon source for this purpose. The long chain fatty acids (LCFA) analysis showed that lipidic bodies accumulated by *Y. lipolytica* W29 were mainly composed by linoleic acid, followed by palmitic and oleic acid. Under these specific growth conditions, LCFA profile of total lipids was similar to the one from common vegetable oils.

The simultaneous induction of lipase and SCO production by *Y. lipolytica* growing in WCO led to a sustainable and economical viable production of oils enriched with essential fatty acids, which has wide application in pharmaceutical and food industries, or microbial lipids for biodiesel process.