Use of castor oil and its derivatives to produce γ-decalactone by the yeast Yarrowia lipolytica: optimization of operating conditions

Nelma Gomes¹, José A. Teixeira, Isabel Belo

IBB-Institute for Biotechnology and Bioengineering, Center of Biological Engineering, University of Minho,
Campus de Gualtar, 4710-057, Braga, Portugal.
Email: nelmagomes@deb.uminho.pt

Castor oil is a natural oil obtained from the seed of the castor plant, Ricinus communis. It is non-toxic, biodegradable and a renewable resource. Chemically, it is a triglyceride of fatty acids. Approximately 90% of the fatty acid content is ricinoleic acid (12-hidroxioctadec-9-enoic acid), a hydroxylated C₁₈ fatty acid that in its esterified form is the major constituent (about 80%) of castor oil, which makes it an abundant compound.

The yeast Yarrowia lipolytica is one of the more intensively studied non-conventional yeast species. This microorganism is not only of interest for fundamental research, but also for biotechnological applications (1). Y. lipolytica is able to carry out the biotransformation of ricinoleic acid into γ-decalactone (3), a peach-like aroma compound well known in several food and beverages, reason why the food industry has a high interest in its biotechnological production. Since this yeast has a GRAS status, a natural label is conferred to the aroma which is very important, considering the increasing health- and nutrition-conscious lifestyles (2).

In the present work two different ricinoleic acid sources (methyl ricinoleate and castor oil) at different concentrations were tested as substrates. Although higher amounts of γ-decalactone (≥ 2 gL⁻¹) were achieved with oil concentrations of 3% and 5% (v/v) for each substrate, the productivity of the overall process was small (10 to 14.5 mgL⁻¹h⁻¹). Work is now focused on the productivity improvement.


¹ Corresponding author. E-mail: nelmagomes@deb.uminho.pt.