



The Development of Engineering Strategies for Enhanced Oil Accumulation and Fatty Acid Modification in Oleaginous Microorganisms

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Microbial

Total lipid content

estimation

strain

Final

product

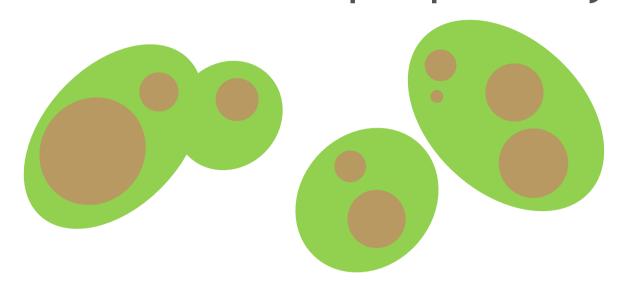
Background

Cultivation -

media

Microbial oils

- Lipids stored as excess energy source
- Intracellular accumulation
 - De novo lipid pathway



- Multiple applications
 - Based on fatty acid (FA) profile

Strategies to reduce production cost

- Low-cost substrates (industrial by-products/wastes)
- Genetic mutation
- Target oil production

Oil accumulation & FA modification

Aims and objectives

Aim

Investigate oil production in oleaginous microbes and to devise production strategies to control the quantity and quality of the oils being produced

Main objectives

- 1. Identification and selection of strains suitable for large-scale production
- 2. Evaluate effect of operating conditions, industrial substrates & cultivation modes on oil production
 - 3. Upscale to a bioreactor

Methodology

Microbial oil production

Microorganism

cultivation

Biomass harvesting

Cell disruption

(pre-treatment)

Lipid extraction

Product

purification

Identification and selection of microbial strains Comparison of rapid oil quantification methods

High level economic analysis to quantify economic viability

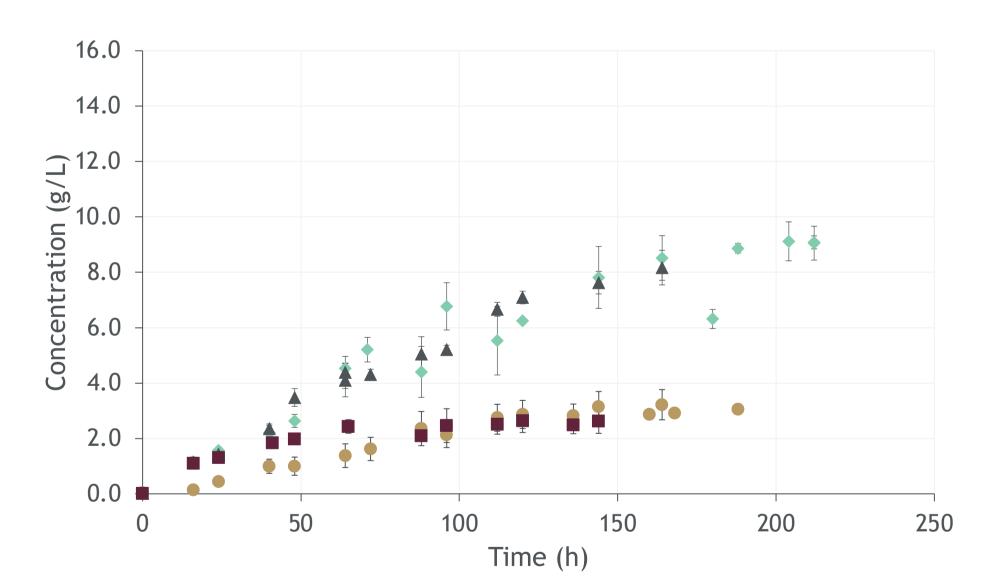
Evaluation of operating conditions in a bio reactor

Evaluation of operating conditions on oil production

Evaluation of industrial substrates

Investigation of reactor sequencing options

Results to date - Variation in operating conditions



• R. toruloides ▲ Y. lipolytica • Aurantiochytrium sp. ■ S. limacinum Figure 1: Growth curves produced for strains at 30°C in a water bath (insufficient oxygen saturation)

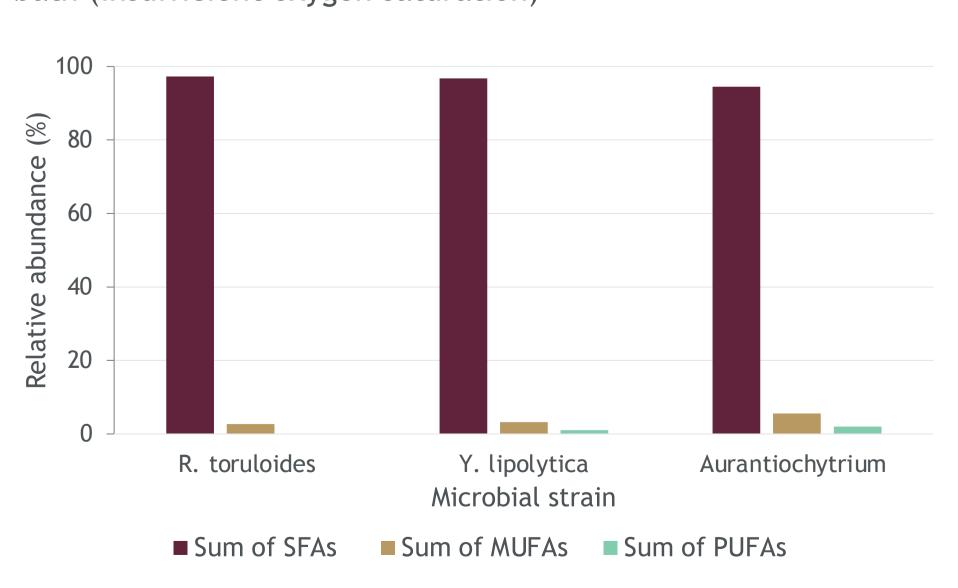
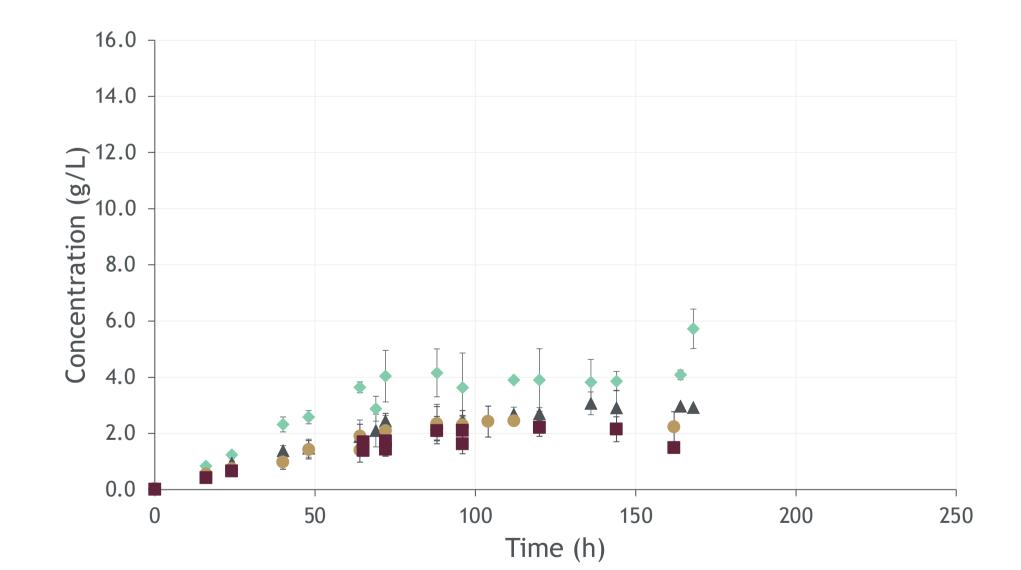


Figure 4: Sum of fatty acids in microbial oil produced at 30°C in a water bath (insufficient oxygen saturation)



R. toruloides ▲ Y. lipolytica ● Aurantiochytrium sp. ■ S. limacinum
Figure 2: Growth curves produced for strains at 20°C in a water bath (insufficient oxygen saturation)

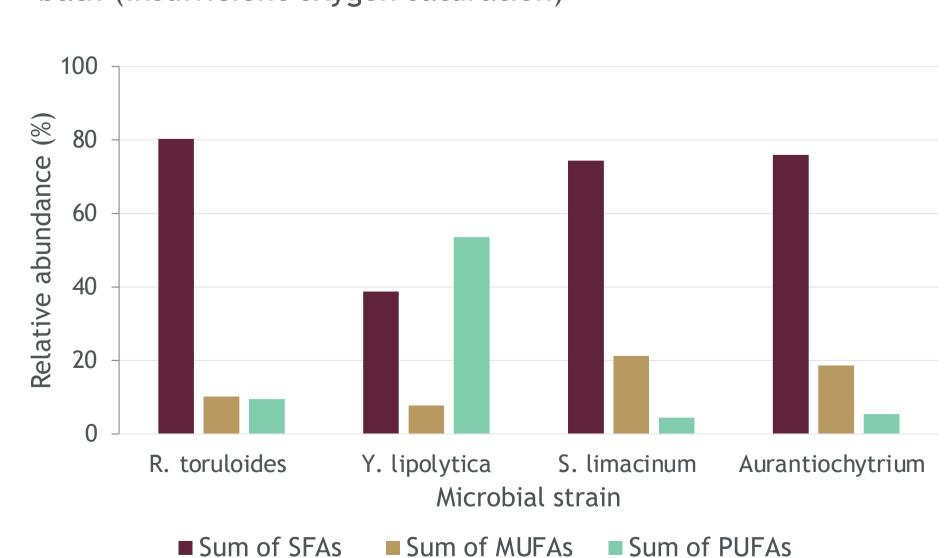
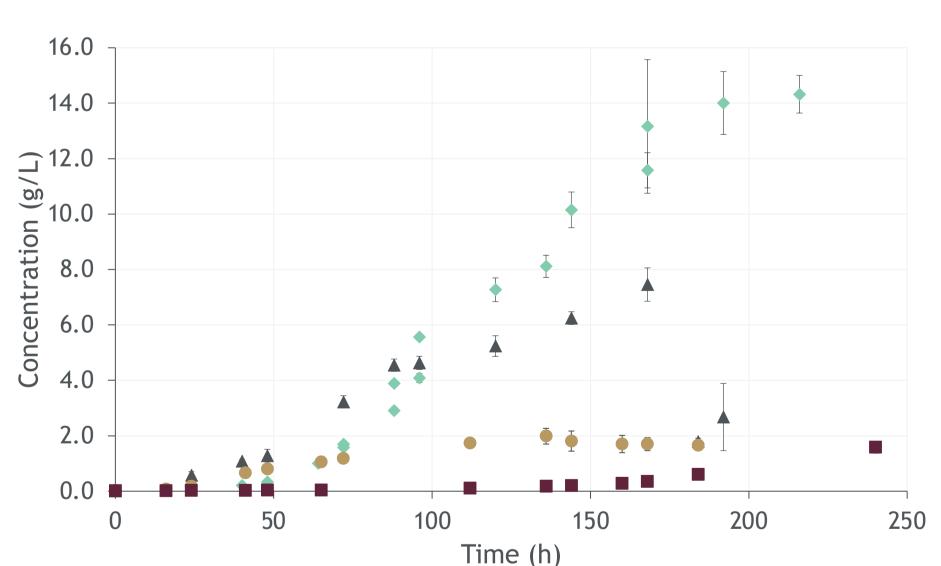


Figure 5: Sum of fatty acids in microbial oil produced at 30°C in an incubator (moderate oxygen saturation)



◆ R. toruloides ▲ Y. lipolytica ● Aurantiochytrium sp. ■ S. limacinum Figure 3: Growth curves produced for strains at 10°C in a water bath (insufficient oxygen saturation)

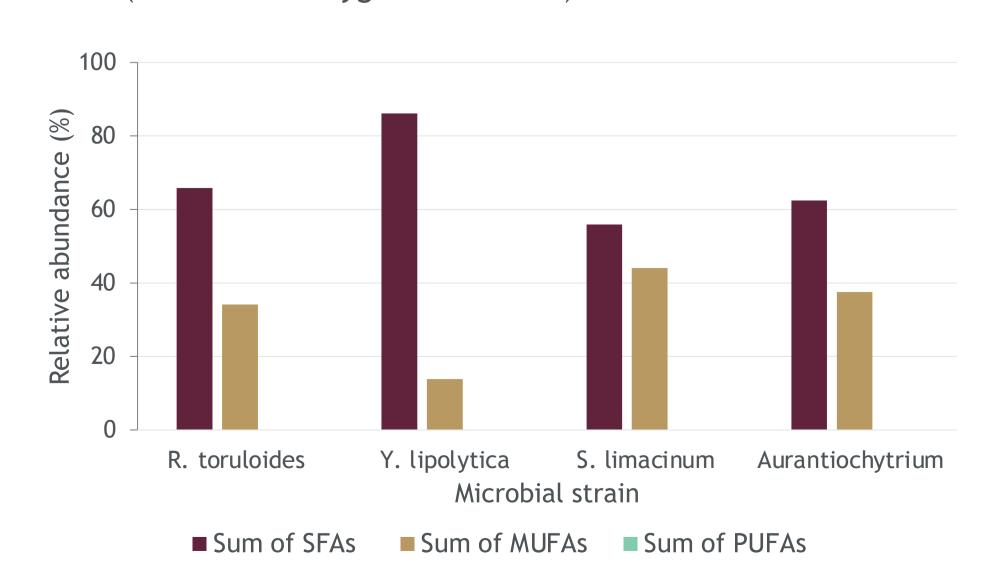


Figure 6: Sum of fatty acids in microbial oil produced at 10°C in a water bath (insufficient oxygen saturation)

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