

Production of Pure Microbial Oil (PMO) as a basis for the production of biodiesel



N.A. van Biezen¹, E.A.W. van Dinther¹, Lin L.¹, J.E. Schouwenberg¹, R.H. Kleijntjens², L.R. Buning³, C.A.M.J.J. van den Hondel¹, B.C. Lokman¹

¹ HAN BioCentre

P.O. Box 6960, 6503 GL Nijmegen

² Argos Groep B.V.

P.O. Box 129, 3190 AC Rotterdam-Hoogvliet

³ HAN ARL-Automotive

P.O. Box 2217, 6802 CE Arnhem



Introduction

Biodiesel is produced by the (m)ethylation of natural oils coming from plants or animals, resulting in the more volatile fatty acid (m)ethyl esters (FAME or FAEE). Using food crop oils (sunflower, soy and palm) for the production of biodiesel result in an undesirable competition between food and energy. Therefore, these oils should be preferably produced from waste materials or specially grown crops (e.g. used cooking oil, Jatropha or algae).

A potentially promising alternative for the production of natural oils could be the use of 'obese' micro-organisms that produce Pure Microbial Oils (PMO). These micro-organisms have substantial advantages compared to plants and algae viz.:

- Higher growth and production rates.
- Higher oil contents (>60%).
- More efficient use of rural area (vertical versus horizontal cultivation).
- No competition (yet) with the food market.

Project approach

- Screening of PMO-producing organisms.
- Cultivation of PMO-producing organisms in bioreactors.
- Development of a scalable PMO isolation technique.
- Conversion of PMO to biodiesel.
- Testing of motor performance with PMO-biodiesel.

Results

Cells of various strains were treated with NaOH to hydrolyse the PMO. After acidification the whole matrix was extracted with ethylacetate to extract the formed fatty acids. The ethylacetate extract was analysed by TLC to investigate the amount of the fatty acids. Promising strains were selected by combining biomass and fatty acid production.

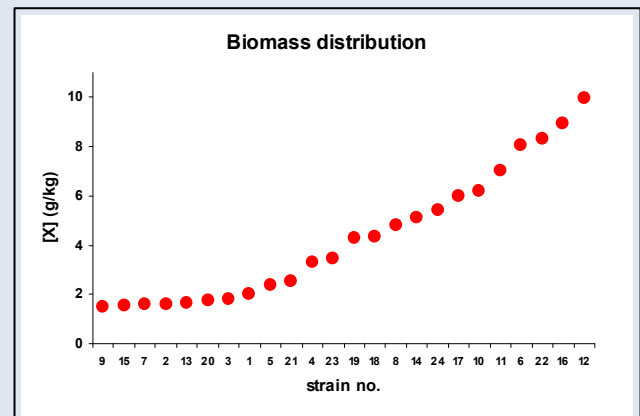


Figure 1: Biomass yield with various strains

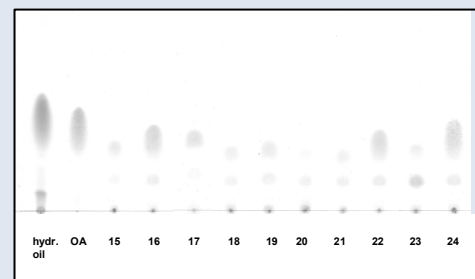
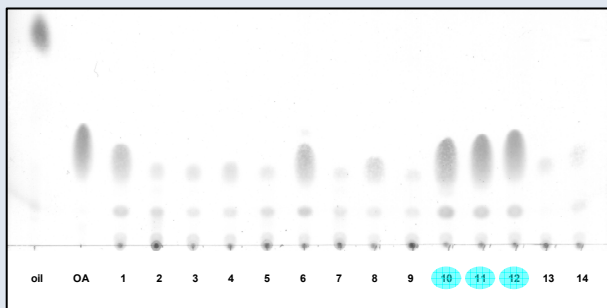


Figure 2: TLC analysis of whole cell extracts. Oil = sunflower oil, OA = oleic acid (C18:1)

Conclusion / Future Plans

Several promising PMO producing strains were identified and their production potential will be further investigated in fermenters. GC-MS analysis will reveal the quantity and quality of the formed PMO.

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