INTER-STRAIN COMPARATIVE LIPIDOMICS OF MICROALGAE USING MULTI-DIMENSIONAL SEPARATION TECHNIQUES

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INTRODUCTION

With the increase of petroleum prices in recent years, alternative forms of biodiesel are gaining significant interest as replacements since they are both renewable and cleaner-burning as opposed to fossil fuels. One emerging form of biodiesel production is from the cultivation of microalgae—lipid-rich species of microalgae. A major challenge in using microalgae as biodiesel feedstock is that the lipid profile of microalgae varies between species, strains and growth conditions. Knowledge of the suitable microalgal species and the right cultivation strategy for feasible biodiesel production is paramount for success and for the scalability of the lipid production technique. Biodiesel production from non-edible crops is also a matter of concern, and there is an urgent need for an accurate analytical procedure to assess the lipid quality without delay.

In this study, we compare the lipid profiles, particularly in the glycerolipid class which constitutes the potential biodiesel yield, of two microalgal species from different growth conditions using multi-dimensional UHPLC-MS coupled to quadrupole time of flight mass spectrometry.

RESULTS & DISCUSSION

Comparison between single vs. multi-dimensional separations

- Multi-dimensional separations increase peak capacity obtained from the improved resolution and dynamic range of the individual lipid peaks within each class. In addition, no time points are significantly shorter.

2D-UPLC Flow Diagram

OLPLS-DA plot comparing the two algal strains

- The OLPLS-DA plot shows clear differences between the glycerolipid composition between algal strains MUR231 and MUR158.

- The plot also reveals that MUR231 has a larger variation between the various samples when compared to the MUR158 strain.

Biomarker identification

We have shown that this novel multi-dimensional separation technique is a powerful tool for biodiesel production from microalgae as it allows for rapid, reliable and sensitive discrimination of the lipid profile across growth conditions and strain.

Application of this superior analytical technique will be vital at the commercial scale production phase. The use of multi-dimensional separations will allow for speedy and critical assessment of the lipid quality of the microalgal cultures at any given point in time.

CONCLUSIONS

REFERENCES