FOOD & BIOBASED RESEARCH

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Properties of extracellular polysaccharides from *Botryococcus braunii*

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Background

The 4-year FP7 SPLASH project (www.eu-splash.eu) will develop a new biobased industrial platform using microalgae as a renewable raw material for the sustainable production and recovery of hydrocarbons and extracellular polysaccharides (EPS) from the species *Botryococcus braunii* (Figure 1) and further conversion to renewable polymers.

Objective

The microalgae *B. braunii* is known for its production of EPS. Here, the properties of the EPS for possible non-food applications are presented.

Introduction

B. braunii race A was grown in flat tubular photobioreactors. The algal cells were removed by centrifugation. The supernatant, containing the EPS, was microfiltrated to eliminate any remaining cells and subsequently diafiltrated to remove salts. Two fractions were obtained; Fraction A containing the retentate after diafiltration and Fraction B containing the rinse of the 10kDa membrane after diafiltration. Both fractions were lyophilized and used for further analysis.

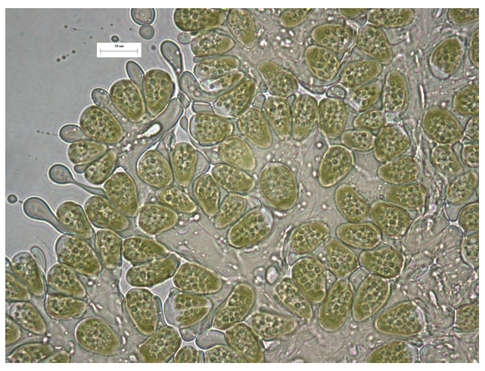

Figure 1. *Botryococcus braunii* (photograph: Joao Gouveia)

Results

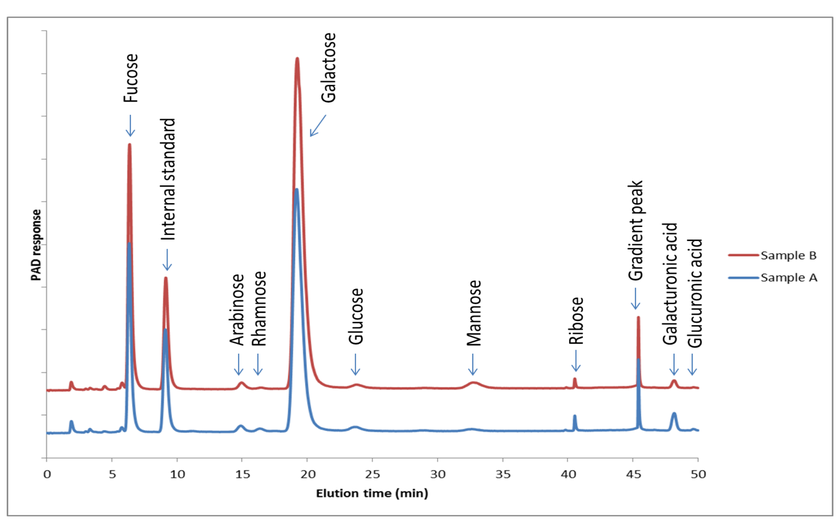

Figure 2. High Performance Anion Exchange Chromatography of hydrolysed exopolysaccharides from *Botryococcus braunii*.

High performance anion exchange chromatography analysis showed that galactose and fucose were the main sugars in both fractions. Other sugars, i.e. arabinose, rhamnose, glucose, mannose, galacturonic acid and glucuronic acid, were only present in small amounts (Figure 2). FT-IR indicated that no sulphate groups were present.

Results

High performance size exclusion chromatography revealed that the molecular weight of Fraction A was between 5×10^5 – 2×10^6 g mol^{-1} and Fraction B was higher than 2×10^6 g mol^{-1} (Figure 3).

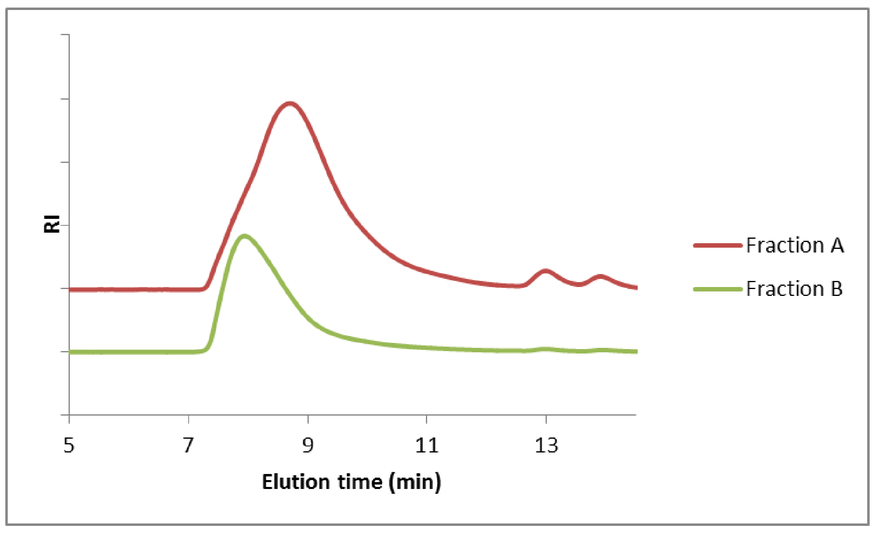

Figure 3. High Performance Size Exclusion Chromatography of extracellular polysaccharides from *Botryococcus braunii*.

Results

The dynamic viscosity was higher for Fraction B and showed a pseudo-plastic behaviour. No yield stress was observed for both fractions. The kinematic viscosity of both fractions was comparable with apple pectin, although Fraction B showed a slightly higher value. The dynamic surface tension was lower for Fraction B and the values obtained are similar to beet pectin. Foaming and emulsification experiments are in progress.

The EPS fractions were also tested in bio-assays. Both fractions showed no effect as angiotensin converting enzyme (ACE) inhibitors, which are drugs that reduce high blood pressure. In addition no effect as DPP-4 inhibitor was found. These type of enzyme inhibitors are used in the treatment of type 2 diabetes.

Conclusions

- *B. Braunii* EPS is a long chain polymer.
- Due to its pseudo-plastic behaviour the EPS has the potential to be used in wall paints.

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