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Synthesis, characterisation and physicochemical properties of hydrophobically modified inulin using long-chain fatty acyl chlorides

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#### Highlights

- Inulin has been esterified using fatty acid acyl chlorides in aqueous solution
- The inulin derivatives form micellar structures in solution
- C10-C14 inulin derivatives are able to form stable oil-in-water emulsions
- C16 derivatives are able to form stable water-in-oil emulsions

#### Abstract

A series of inulin derivatives were synthesized in aqueous solution using acyl chlorides with varying alkyl chain length (C10-C16). They were characterised using a number of techniques including MALDI TOF-MS, <sup>1</sup>H NMR and FTIR and their degree of substitution determined. The solution properties of the hydrophobically modified inulins were investigated using dye solubilisation and surface tension and it was confirmed that the molecules aggregated in solution above a critical concentration (critical aggregation concentration, CAC). The value of the CAC was found to be reasonably consistent between the different techniques and was shown to decrease with increasing hydrophobe chain length. It was found that the C10, C12 and C14 derivatives formed stable oil-in-water emulsions and the emulsion droplet size decreased with increasing alkyl chain length. The C16 derivative was not able to produce stable oil-in-water emulsions; however, it was able to form stable water-in-oil emulsions. The fact that the derivatives are able to form micellar-like aggregates and stabilise emulsions makes them suitable candidates for the encapsulation and delivery of active compounds with potential application in food, cosmetic, personal care and pharmaceutical formulations.

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