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Solubilization of aromas by cyclic and acyclic dextrins based DES: A comparative study

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ABSTRACT

There is a growing interest for aromatic and biological properties of essential oils as alternatives to synthetic chemicals and drugs [1]. However, essential oils and their components are poorly soluble in aqueous systems and are highly sensitive to degradation and evaporation. These drawbacks can be overcome by encapsulation into various systems, *e.g.* liposomes, emulsions, nanoparticles and cyclodextrins (CD) or solubilization in deep eutectic solvents (DES) [2–5]. The aim of the present study was to compare the ability of DES based on cyclic and non-cyclic dextrins to retain, solubilize and ensure a prolonged release of aroma. The present also aimed to evaluate the effect of water dilution on the performance of these systems. Solvents were prepared using either cyclodextrins, or acyclic dextrin, maltodextrins (MD) as hydrogen bond acceptors and lactic acid as hydrogen bond donor. The obtained solvents were then submitted to physicochemical characterization (viscosity and density measurements quantification of water content using Karl Fisher titration). Their storage stability was evaluated using 13C NMR spectroscopy. Then, retention and solubility studies were performed in different DES/water (wt%) mixtures. The ability of the same mixtures to ensure a sustained aroma release was also investigated. Additionally, 1H and DOSY 1H NMR as well as 2D ROESY were carried out in order to monitor the disruption in the structure of the solvent and to track the type and variation of interaction between aroma and DES components upon water addition. Our findings demonstrated the ability of CD based DES to maintain greater retention and solubilization potential upon dilution compared to MD-based one. Results also evidenced their capacity to achieve delayed and prolonged aroma release. This could be attributed to the ability of CDs to include and encapsulate aroma as confirmed by the examination of 2D ROESY plots in the different DES/water mixtures. Altogether, these results will encourage the use of CDs based DES in aromas and fragrance formulations, active food packaging, etc.

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