

Extended Abstract

Evaluation and Optimization of Polysaccharides and Ferulic Acid Solubility in NADES Using Surface Response Methodology [†]

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Response surface methodology (RSM) is an experimental approach composed of statistical and mathematical tools that aims to develop, improve and optimize a predictive model for a response (an output variable), which is influenced by several factors (input variables) [1]. RSM was developed in 1951 [2] to minimize the number and inaccuracy of physical experiments, and it has grown into modelling of numerical experiments. Using RSM in Design Expert® software, we aimed to evaluate and optimize the solubility of ferulic acid (FA) and polysaccharides such as microcrystalline cellulose (MCC) in two natural deep eutectic solvents (NADESs), ethaline and reline. For the optimization of the process, we used a two-level factorial model that suggested a total of 22 experiments, creating relevant combinations among three variable factors: ferulic acid concentration, polysaccharide concentration and NADES solution concentration. For each of them, an interval of variation was set, composed of a minimum value, a maximum and a medium one. After the preparation of NADES, the set samples were prepared, vortexed, ultrasonicated and centrifuged. The supernatant was acquired and used for UV-Vis spectroscopy, revealing the percentage of ferulic acid solubilized in the natural deep eutectic solvents. The sediment was analyzed by gravimetric methods to observe the polysaccharides' solubility in NADESs. In addition, FT-IR was used to observe the interactions between all the components. The ANOVA analysis tool contained by the software was employed to determine a polynomial equation that describes the variables' influence on the polysaccharides and FA solubility in NADESs, as well as their synergic effect. By processing the information, we obtained graphical and numerical results that showed a high correlation with the factorial model, exhibiting an adequate ratio between the variable factors in order to ensure the desired solubility in the case of ferulic acid and polysaccharides in natural deep eutectic solvents.

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