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Green extraction of curcumin in stable emulsions and design of bioactive dry formulations

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PURPOSE OF THE ABSTRACT

The objective of this study is to address two major challenges. The first one is to propose an environmentally friendly and economically sustainable extraction technology of natural products. Ultrasound is a key-technology in achieving this objective [1,2]. Indeed, ultrasound assisted extraction can be completed in minutes with high reproducibility and limited solvent consuming compared to conventional extraction. However, it is not possible to completely exclude the use of solvents because a large number of bioactive molecules of plant origin are poorly soluble or even insoluble in water. This lipophilic nature of the extracted biologically active ingredients leads us to the second challenge, which is their encapsulation in delivery systems like emulsions to allow their solubilization in water and protection from degradation.

With these objectives in mind, an aqueous extraction process with biocompatible oils and a bio-sourced surfactant has been developed. This innovative process, called "Extremulsions" [3], enables achieving stable formulations in a limited number of steps. The resulting nanoemulsions can be dried to obtain a powder enriched with lipophilic active molecules. The latter dry formulation being an attractive ?easy to store and ready to use? ingredient for a wide range of industrial applications. In this poster we will present our work dealing with the dual extraction /formulation of curcumin from rhizomes of Curcuma longa in a solvent-free ultrasound-assisted process. A first study was assessed to find the best emulsion ratio between oil (for best curcumin solubilization) and surfactant (for droplet stabilization) leading to optimal nanoemulsions in terms of droplets size and polydispersity. Then the best conditions were applied to the matrix allowing curcumin levels comparable to those obtained by the traditional Soxhlet method in acetone. These preliminary results make this process a promising alternative method in the search for new eco-extraction processes.

[1] Chemat, F.; Rombaut, N.; Sicaire, A.-G.; Meullemiestre, A.; Fabiano-Tixier, A.-S.; Abert-Vian, M. Ultrason. Sonochem. 2017, 34, 540?560.

[2] Azmir, J.; Zaidul, I. S. M.; Rahman, M. M.; Sharif, K. M.; Mohamed, A.; Sahena, F.; Jahurul, M. H. A.; Ghafoor, K.; Norulaini, N. A. N.; Omar, A. K. M. J. Food Eng. 2013, 117 (4), 426?436.

[3] Contino-Pépin C.; Dall'Armellina A.; Desgranges S.; Letan M.; Duval C. FR1902826 (Mars 2019)

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

green extraction | curcumin | nanoemulsion | ultrasound

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[2] Azmir, J.; Zaidul, I. S. M.; Rahman, M. M.; Sharif, K. M.; Mohamed, A.; Sahena, F.; Jahurul, M. H. A.; Ghafoor, K.; Norulaini, N. A. N.; Omar, A. K. M. J. Food Eng. 2013, 117 (4), 426–436.

[3] Contino-Pépin C.; Dall'Armellina A.; Desgranges S.; Letan M.; Duval C. FR1902826 (Mars 2019)