Novel Tocopherol-loaded Nanoemulsion for Enhanced Biodispersibility: Safety Food Delivery-System

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Abstract

Statement of the Problem: A great attention has been received in the last decade for nanotechnology applications in food as well as in pharmaceutical industries. Bioactive substances-loaded Nanoemulsion is designed to improve their low bioavailability within the host, masks their unpleasant flavor, expands the application range, and increases overall acceptability. Therefore, it is necessary to use good emulsifiers to improve its physical stability and to reduce the interfacial tension between the two immiscible phases. This enables the formation of small droplet during homogenization, reflecting an obvious enhancement of the emulsion's physical stability. Thus, the main goal was the development of stable nanometric delivery system, of interest prolonged release in in food industry (functional food, additives ingredients, ...) and / or drug delivery system (dietary supplement, nutraceutical formulation, active targeted administration, ...). Methodology & Theoretical Orientation: The effect of the interaction between Gum Arabic (GA) and Tween 80 (T80) at different ratios on the droplet size diameter (d3.2) and interfacial tension (IFT) of tocopherol based nanoemulsions (TO-NE) has also been investigated. Findings: The physical parameters measurements showed that when T80 interacted with GA at ratio (0.75: 0.25 v/v) into the aqueous phase, it synergistically reduced the d3.2 and IFT to 106 nm and 11.3 mN/m respectively. A follow-up study of stability examined the stabilizing mechanism of the NE, showing a good stability against ionic strength up to 500 mM of NaCl, for all-range of temperature values and over time in 4 °C, neutral pH and without salt addition showing a nanometer-sized droplets. We postulate a competitive adsorption of T80 and GA at the oil-water interface. Conclusion & Significance: The microencapsulation by emulsion offers an effective way to protect microbes in adverse in vitro and in vivo conditions reflecting a promising approach for the large-scale production of microencapsulation with potential application in various fields encompassing, agriculture, food, pharmaceutical and biomedical industries.

Image

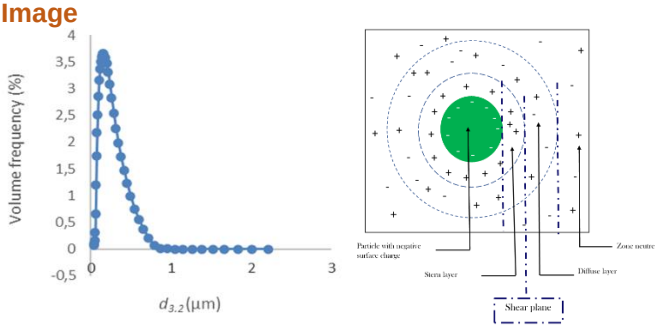


Figure 1 : Nanoemulsion droplet size distribution : Illustration of the electrostatic stabilisation provided by the binary emulsifier system (T80 : GA 0.75 : 0.25 v/v)

Recent Publications

1. Sana, Y., Isao, K., Kunihiko, U., Mitsutoshi, N., Isoda, H., Riadh, K., Moufida, S. and Marcos, A. N. (2021) Essential Oil- loaded Nanoemulsion Lipidic-Phase Optimization and Modelling by Response Surface Methodology (RSM) for the Enhancement of their Bioavilibility in the Nanometric Delivery- System. Foods, https://doi.org/10.3390/ foods10123149,

1. Grace, L., Sana, Y., Cherry, M. V., Kunihiko, U., Isao, K., Chieko, T., Mitsutoshi, N. and Marcos, A. N (2020) Spray technology applications of xanthan gum based edible coatings for fresh-cut lotus root (Nelumbo nucifera). Food Reearch International. 137, 109723,0963-9969, https://doi.org/10.1016/j.foodres.2020.109723 .

2. Yakoubi, S., Bourgou, S., Mahfoudhi, N., Hammami, M., Khammassi, S., Horchani-Naifer, K., Msaada, K., Tounsi, M.S., (2020). Oil-in-water emulsion formulation of cumin/carvi essential oils combination with enhanced antioxidant and antibacterial potentials. Journal of Essential Oil Research. https://doi.org/10.1080/10412905.2020.1829510 ,



Biography Dr. Sana Yakoubi

Dr. Sana Yakoubi holds a PhD in Biological sciences on the topic of "Novel nanometric delivery system development for active substances for enhanced bioavailability". Her Master researchs in Biochemistry focused on the "Inflammation Modulation by *Macrovipera lebetina* venom-derived C-type lectins". She conducted several works on Innovation Medical Research Institute Japan (IMRI), Division of Food Engineering, Food Research Institute, (NARO), Graduate School of Life and Environmental Sciences, University of Tsukuba, University of Medicine and Pharmacy, Aix-Marseille, IHU Méditerranée Infection and Faculty of Science of Tunis University of Tunis El Manar. She authored different papers in peer-reviewed international journals and has several communications in scientific meetings and international conferences. She is a reviewer in international journals. Her researchs have been focused on the development of stable biomolecules nanometric delivery system in different storage conditions and the stability mechanism of interest prolonged release in drug delivery system and / or in food industry.

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