Supplementary Information

Nanoemulsion of Kefiran and Coriander (*Coriandrum sativum* L.) Essential Oil: Chemical and Technological Aspects

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Gel permeation chromatography to kefiran polysaccharide

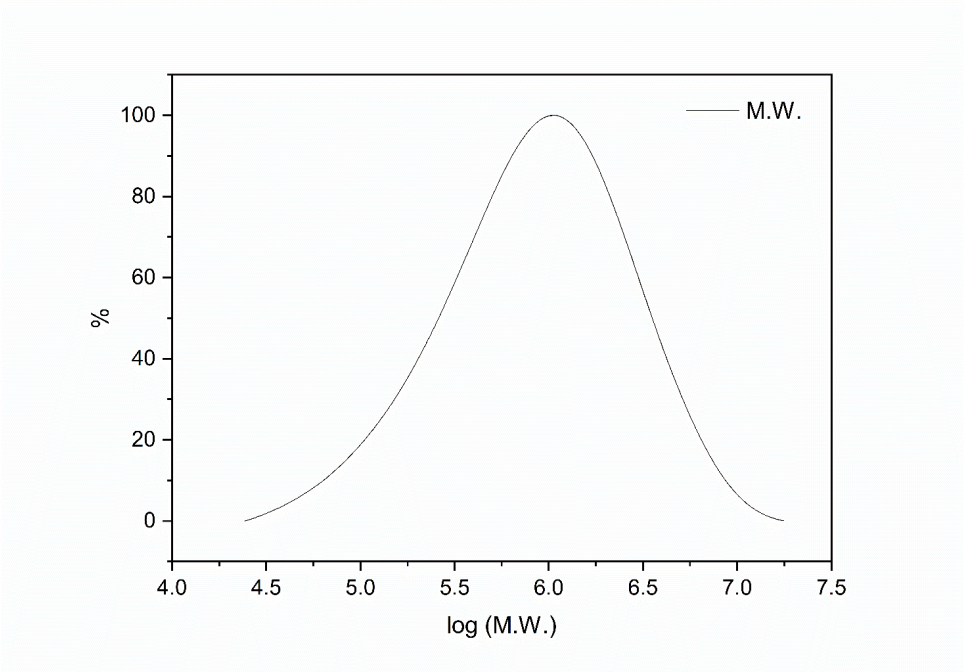

Figure S1. Gel permeation chromatography to kefiran polysaccharide.

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Infrared spectrum of kefiran polysaccharide

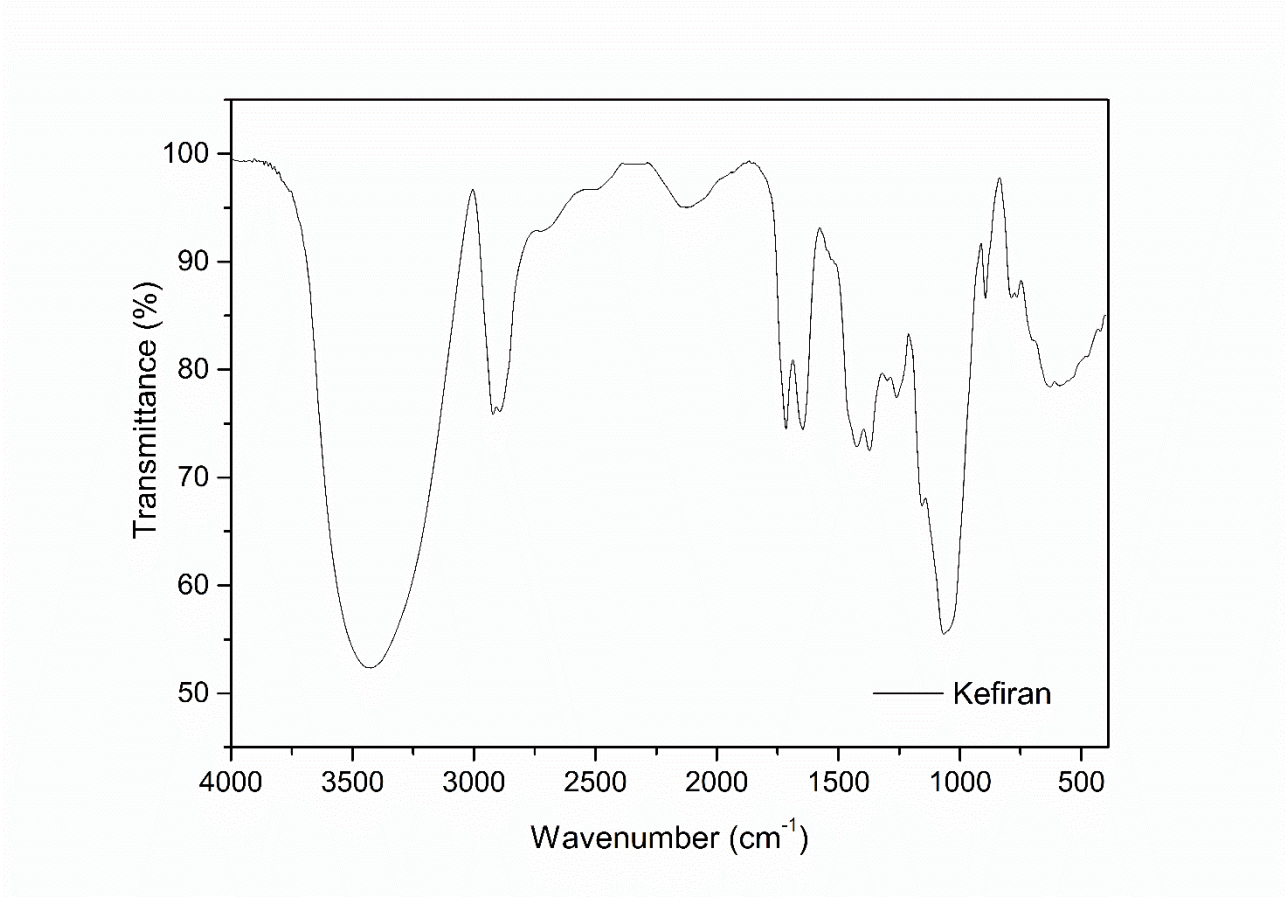

Figure S2. Infrared (KBr) spectrum of kefiran polysaccharide.

Coriander essential oil (CEO) and oleic acid (OA) nanoemulsion concentrations used in experimental design

Table S1. Kefiran (KFR), coriander essential oil (CEO) and oleic acid (OA) nanoemulsion concentrations used in experimental design

Sample	KFR / %	CEO / %	OA / %
NE1	0.5	0.5	4.5
NE2	0.5	1.5	3.5
NE3	1.0	0.5	4.5
NE4	1.0	1.5	3.5
NE5	1.5	0.5	4.5
NE6	1.5	1.5	3.5

NE1: KFR 0.5%; CEO 0.5%; NE2: KFR 0.5%; CEO 1.5%; NE3: KFR 1.0%; CEO 0.5%; NE4: KFR 1.0%; CEO 1.5%; NE5: KFR 1.5%; CEO 0.5%; NE6: KFR 1.5%; CEO 1.5%.

Determination of the hydrophilic-lipophilic balance of coriander essential oil

Each nanoemulsion was prepared with the final mass of 10 g, containing 90% (m/m) ultrapure water, 5% (m/m) CEO and 5% of a mixture of emulsifiers. The emulsions were prepared using span 80 (HLB = 4.3) and Tween 80 (HLB = 15), allowing wide range of HLB values from 8 (5% m/m of span 80) to 15 (5% m/m of tween 80) by mixing the emulsifiers in different proportions (Table S2).[1] The emulsions were prepared by sonification in a high-intensity ultrasonic processor (model W-450D, Branson Sonifier brand). Sonifier was equipped with a three mm diameter titanium alloy microtip probe and operated at 50% amplitude with a pulse regime of five seconds on and seven seconds off for two minutes. To avoid heating of the sample an ice bath was used.[2]

Average particle size and polydispersity index at 30 days

The average particle size and particle size distribution (indicated PDI) were determined by dynamic light scattering (DLS) in Zetasizer Nano ZS equipment (Malvern Instruments Inc., Worcestershire, UK). Ultra-pure water was used as dispersant to avoid multiple scattering as well as scattering and droplet interaction effects. Measurements were performed immediately after emulsification, at 0 and 30 days.

Table S2. Surfactant concentrations used in nanoemulsions with different hydrophilic-lipophilic balances

HLB	Surfactant mixture	
	Span 80 / %	Tween 80 / %
8	65.4	34.6
9	57.0	43.0
10	46.7	53.3
11	37.4	62.6
12	28.0	72.0
13	18.7	81.3
14	9.3	90.7
15	0	100

Adapted from Rodrigues *et al*.[2] HLB: hydrophilic-lipophilic balance.

Determination of the hydrophilic-lipophilic balance of CEO

All formulations showed no visible evidence of creaminess or phase separation during the 30 days period. It was possible to observe that for the initial period, the smallest particle sizes were for HLB 14 and 15 (Figure S2), remaining in this way throughout the storage period studied, and showed the lowest values of PDI (Figure S1), with monodisperse characteristic (0.013-0.138). Therefore, for the CEO, HLB 14 was the one that showed greater physical stability, with less variation in average particle size between the initial and final times, with monodisperse characteristic in all performed measurements.

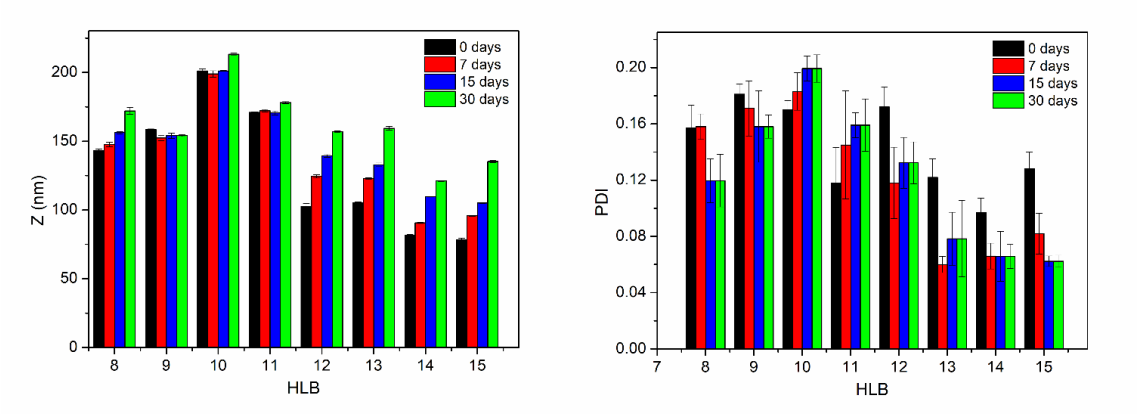

Figure S3. Effect of surfactant mixture on the average particle size (Z) and polydispersity index (PDI) of nanoemulsions with coriander essential oil. HLB: hydrophilic-lipophilic balance.

References

1. Abbas, S.; Bashari, M.; Akhtar, W.; Li, W. W.; Zhang, X.; *Ultrason. Sonochem.* **2014**, *21*, 1265. [Crossref]

2. Rodrigues, E. C. R.; Ferreir, A. M.; Vilhen, J. C. E.; Almeida, F. B.; Cruz, R. A. S.; Florentino, A. C.; Souto, R. N. P.; Carvalho, J. C. T.; Fernandes, C. P.; *Rev. Bras. Farmacogn.* **2014**, *24*, 699. [Crossref]