Emulsions based on buriti (*Mauritia flexuosa*) oil from the Brazilian Amazonia

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INTRODUCTION AND OBJECTIVE

The Brazilian Amazonia has a vast biodiversity with great potential for the development of drugs including oils with therapeutic and cosmetic action. Buriti oil (*Mauritia flexuosa*) is a good example of such product. It presents sunblock, moisturizer, anthelmintic and healing properties, among others. For a better pharmaceutical use of vegetable oils from the Brazilian Amazon an emulsified system, which will provide greater physical and chemical stability of the oil and appropriate therapeutic use, is the best choice.

The technique of Ternary Phase Diagram (TPD) consists on the evaluation of systems from a mixture of surfactant, oil and water at different ratio. These mixtures were then, classified and characterized. The resulting characterization of such mixtures is plotted in an equilateral triangle in which each point on the surface corresponds to the proportions of the components on the mixture (Lawrence 2000).

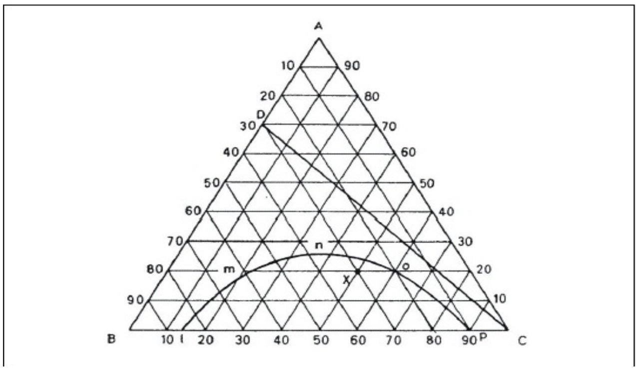


Figure 1 – Schematic representation of a TPD

The aim of this work was to develop a TPD of systems produced with buriti oil from the Brazilian Amazonia. At the end, the best emulsion system generated from this study will be further used to develop a pharmaceutical or cosmetic product.

MATERIAL AND METHODS

Materials Polysorbate 80 (Tween 80®) and sorbitan monooleate (Spam 80®) come from Sigma-US. Buriti oil (*Mauritia flexuosa*) from the Brazilian Amazonia come from the extraction from the burity fruit.

Methods 45 ternary systems were prepared for the development of five TPDs, respectively at HLB 8.58 (TPD-1), 9.65 (TPD-2), 10.72 (TPD-3), 11.79 (TPD-4) and 12.86 (TPD-5) – Table 1. The systems were obtained by sonication process for 10 minutes with power of 45% and temperatures controlled between 40 and 45°C. The systems were produced by mixing polysorbate 80 and sorbitan mono oleate 80 at w/w ration of 4:6 (TPD-1), 5:5 (TPD-2), 6:4 (TPD-3), 7:3 (TPD-4) and 8:2 (TPD-5), respectively (Table 1). The surfactant mixtures were added to the burity oil (oily phase) at oil / surfactant w/w ratio from 1:9 to 9:1. Titrations were done with distilled water.

The formulations, prepared 48 hours before characterization, were observed macroscopically at room temperature (Silva 2009). Moreover, macroscopic and microscopic appearance, pH, electrical conductivity and refractive index of the more stable systems were evaluated. The refractive index (RI), which was determined with an Abbe Refractometer, Carl-Zeiss Jena, using ultrapure water (Milli-Q® with RI of 1.3325) at a temperature of 25 ± 0.5 °C (Formariz 2007), of the buriti oil was also measured.

RESULTS AND DISCUSSION

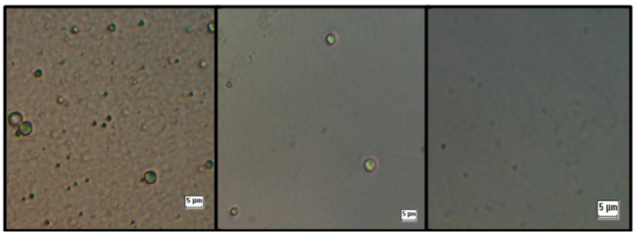
The 45 dispersed systems obtained were classified and characterized as microemulsions (optically isotropic and transparent liquid), emulsions milky and viscous system), nanoemulsions (milky and liquid system) or PS (phase separation in which water and oily phase was separated). (Ke 2005; Djordjevic 2004; Formariz 2007; Formariz 2006; Sintov 2004). Upon completion of the TPD by plotting the identified dispersed systems, the data points in which emulsions were presented were characterized by pH, electrical conductivity (EC) and refractive Index (RI), (Table 1).

Figure 2 shows optical microscopy of 3 data points in which the emulsions presented a droplet size of approximately 5µm (Figure 2-A and 2-B) with HLB 8.58 (from TPD 1) and 10.72 (from TPD 3), respectively. On the other hand, ternary systems generated at HLB 12.86 (from TPD 5) (Figure 2-C) revealed a droplet size not identified by optical microscopy, which suggests a value below 1 µm (nanometric size). Therefore, a deep droplet size analysis is necessary to confirm such assumption. HLB of 12.86 produced more stable ternary system containing 4% of oil, 6% of surfactant and 90% of water. This formulation was characterized as a clear and translucent Winsor IV type system that is characteristic of microemulsion (Winsor, 1948).

Table 1 – Characterization of emulsions.

TPD T/S ratio	pH		EC (µs/cm)		RI	
	M	σ	M	σ	M	σ
1(4:6)	4.58±0.8		44.99±17.4		1.347±0.0	
2 (5:5)	4.58±0.2		45.32±15.3		1.347±0.0	
3 (6:4)	4.58±0.1		49.45±13.7		1.346±0.0	
4 (7:3)	4.52±0.1		53.72±14.1		1.347±0.0	
5 (8:2)	4.48±0.0		59.20±13.4		1.347±0.0	

M= mean; σ= standard deviation; TPD = Ternary Phase Diagram; EC = electrical conductivity; RI = refractive index.



A B C

Figure 2 – Optical microscopy of the ternary systems

CONCLUSIONS

The TPD technique allowed the characterization of emulsion systems using buriti oil as the oil phase. At the HLB of 8.58 and 10.72, a pool of emulsion systems was achieved. Additionally, at a HLB of 12.86, microemulsion and nanoemulsion systems were produced. According to the results, the method of emulsification by high energy sonication revealed to be quite efficient to generate emulsified systems using burity oil. However, the time necessary to turning the system opaque to translucent ranges from 45 seconds to 1 minute and 20 seconds. However, some less stable translucent emulsion systems turned to opaque at the time of 3minutes and 30 seconds, suggesting that time of 4 minutes is mandatory to produce emulsion systems.

Preliminary stability tests and characterization of the emulsion systems suggests that the exhibit a good stability.

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