

## Ultrasound emulsification of supercritical extracts of biquinho pepper (*Capsicum chinense*)

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### Abstract

Capsinoids, recently identified in Biquinho peppers (BP), presents several biological activities, as prevention of tumorigenesis and increase of energy expenditure. In order to verify if the emulsification process could increase the bioactivity of the supercritical fluid (SFE) extracts from BP, emulsified systems were produced by ultrasound emulsification process using Hi-Cap and Snow flakes as emulsifiers. The results indicate that the Snow flakes was more effective in producing small particles, as well as higher emulsification time and power (6 min and 720 W). It was not observed an increase in biological activity of the extract with the emulsification process.

**Key words:** *biquinho pepers, capsinoids, supercritical extraction, emulsion*

### Introduction

The identification of capsinoids in BP opened a new possibility for the valorization of this Brazilian native cultivar. The production of emulsified systems using capsiate-rich extracts may increase the bioavailability of these compounds and also could be applied in the food and pharmacological industries. Thus, the main objective of this study was to verify if emulsified systems of capsiate-rich BP extracts promotes an increase of the bioactivity by the determination of the antioxidant capacity in relation to extract obtained by CO<sub>2</sub> supercritical extraction (SFE).

### Results and Discussion

SFE was used to obtain capsiate-rich oleoresin from BP according to the method developed by Aguiar et al. [1], resulting in a yield of 4.75% (g extract /100 g of lyophilized pepper).

Initially, it was evaluated two different emulsifiers for ultrasound emulsification: Snow flake and Hi-Cap 100 using oleic acid as oil phase. In this first experiments, the time and ultrasound power were kept constant at 4 min and 320 W, respectively.

For the Hi-Cap 100 emulsifier, particle diameter ranged from 479 to 329 nm, and the smallest particle size was obtained at 15 g/L emulsifier concentration and 7.5% (v/v) oil. For the Snow flakes emulsifier, particle diameter ranged from 373 to 320 nm, and the smallest particle size was obtained at 10 g/L emulsifier concentration and 10% (v/v) oil. Based on this results, the emulsifier Snow flakes at 10 g/L concentration and 10% oil phase were the conditions selected to study the influence of ultrasound power and time using an oil phase composed of 25% SFE biquinho oil and 75% olein.

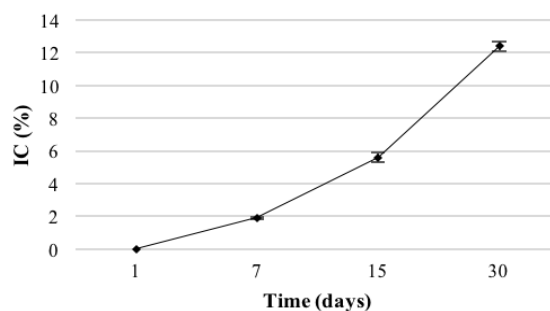
The US emulsification conditions evaluated was power (240, 480 and 720 W) and time (2, 4 and 6 min). The results obtained for the optimization of US emulsification conditions are presented in Table 1. The smallest particles were obtained when applying 480 W during 4 min (254 nm) and 6 min (255 nm).

Regarding the emulsion stability, it was found that the emulsions were physically stable during the first 7 days of storage (Figure 1).

It was not observed an increase in biological activity of extract with the emulsification process, since the results of biological tests did not show significant difference.

**Table 1** Mean emulsion droplet size (Z-average), polydispersity (PDI) and zeta potential (ZP) of the emulsions of Snow Flakes and oleic acid: capsicum oil.

Exp.	Time (min)	Power (W)	Z-average	PDI	ZP (mV)
1	2	10	280±20	0,208	-45±6
2	2	15	280±12	0,1903	-44±5
3	2	20	285±34	0,1926	-40±6
4	4	10	285±18	0,1753	-43±6
5	4	15	254±8	0,1493	-44±5
6	4	20	260±20	0,1603	-44±5
7	6	10	277±17	0,1613	-44±5
8	6	15	255±16	0,1433	-44±6
9	6	20	259±18	0,1643	-45±6
10	4	15	259±20	0,1546	-44±6
11	4	15	255±6	0,164	-43±6



**Figure 1** Emulsion stability during storage for 30 days.

### Conclusions

Experiments suggest that Snow Flakes emulsifier (10 g/L), 10% oil phase, 720 W and 6 min were the best experimental conditions for obtaining the smallest emulsions (~ 255 nm) by ultrasound emulsification. It was not observed an increase in the biological activity of the SFE biquinho extracts when in the form of emulsions.

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[1] A.C. Aguiar, P. Santos, J.P. Coutinho, G.F. Barbero, H.T. Godoy, J.Martinez. LWT - Food Sci. Technol. 59 (2014) 1239–1246.