

Development of an ultrasonic method for effective extraction of capsaicin as a potent bioactive compound

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Introduction

• Many recent studies concerning the medicinal use of capsaicin as a bioactive compound, justify the demands for new and effective methods of its extraction. Its pharmacological activity includes antihyperlipidemic, antiglycemic, anti-oxidative, antitumor properties. The majority of basic research studies suggest that capsaicin induces cell-cycle arrest or apoptosis or inhibits proliferation in different malignant cells including lung cancer, adeno carcinoma, pancreatic cancer, breast cancer. In many cases this activity of capsaicin is concentration dependent and that is one of the reasons for establishing a method for more effective extraction of capsaicin from hot peppers. Moreover synergistic effect of capsaicin with the effects of the other bioactive compounds of the peppers (vitamin C, vitamin E, quercetin, luteolin, carotene), makes these extracts more effective in potential antitumor therapy.

Materials and methods

• This method for capsaicin extraction was performed by using an ultrasonic bath with frequency of 35 kHz. We have used three different ratios of solid/liquid phase, different extraction times (20 to 60 min), and different temperatures (45 to 60°C). Concentration of capsaicin in the extracts was measured by HPLC-DAD.

Results

• Results obtained from liquid chromatography showed that capsaicin concentration was highest in the extract obtained with 1:25 (solid/liquid ratio), with ethanol (96% V/V). Results for time and temperature dependency on the efficiency of extraction of capsaicin showed that concentration of capsaicin in extracts from 50 and 60°C, is 0.406 mg/ml and 0.726 mg/ml, successively, and for the time of 60 minutes the highest concentration of capsaicin was obtained 0.685 mg/ml.

Table 1.A Dependency of extraction efficiency of the solid/liquid ratio

solid/liquid ratio (g/mL)	conc. of capsaicin (mg/mL)
0.25/ 25	0.276
0.5 / 25	0.451
1 / 25	0.975

Table 1.B Dependency of extraction efficiency of the time of extraction

time of extraction (min)	conc. of capsaicin (mg/mL)
20	0.451
40	0.599
60	0.685

Table 1.C Dependency of extraction efficiency of temperature for extraction

temperature of extraction (°C)	conc. of capsaicin (mg/mL)
45	0.451
50	0.406
60	0.726

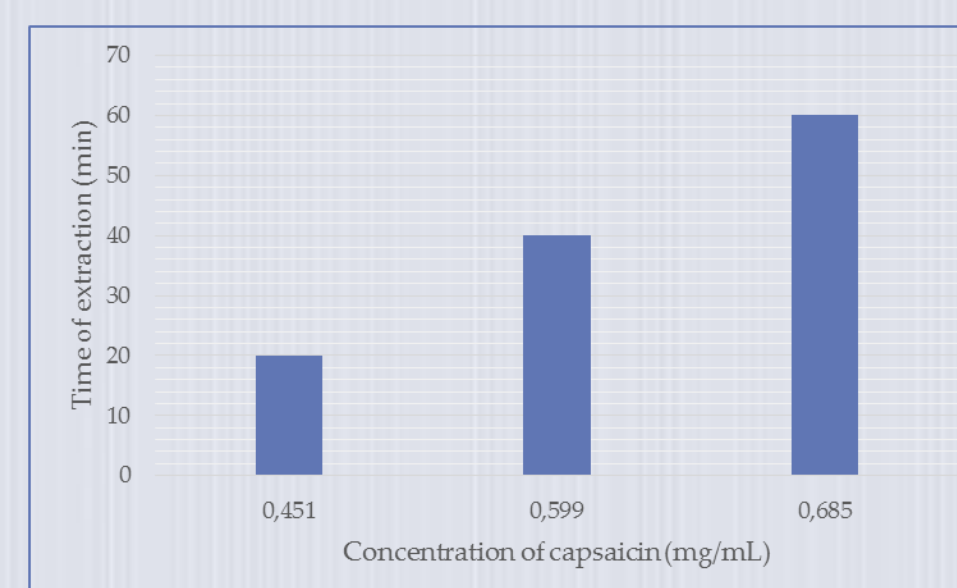


Figure 1 Concentration of capsaicin obtained with ultrasonic bath with different time of extraction

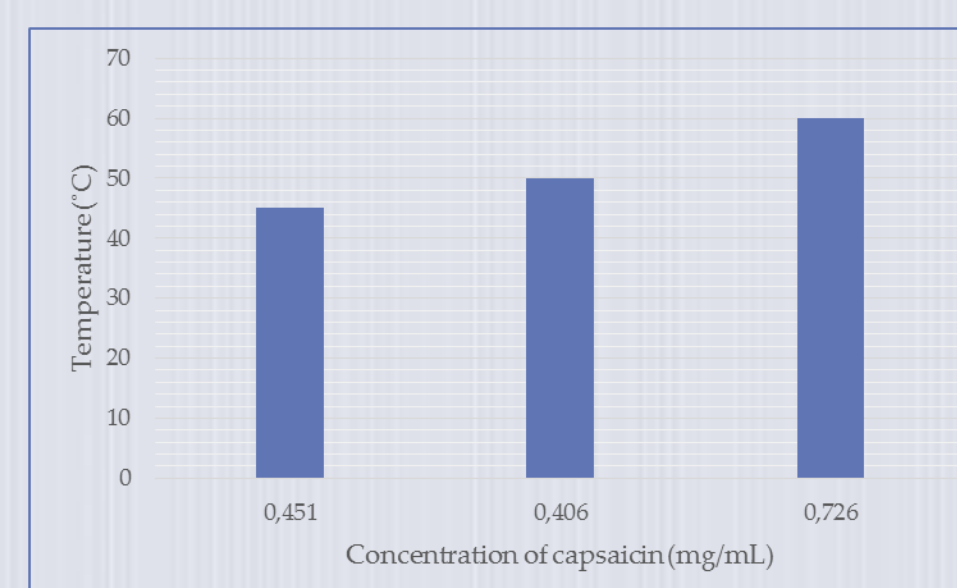


Figure 2 Concentration of capsaicin obtained with ultrasonic bath with different time of extraction

Conclusion

As a conclusion of this study we can propose that extraction time of 60 min on temperature of 60°C for 1/25 (solid/liquid ratio), gives the most efficient extraction of capsaicin. Optimization of the conditions for ultrasonic method of extraction is one of the key factors for obtaining an extract with high concentration of capsaicin, and protected pharmacological activity.