Microwave assisted extraction of capsaicin from Capsicum

Abstract: a new method of extracting capsaicin from dried capsicum by microwave drying equipment was studied. The extracted capsaicin was separated and quantified by H P L C. The results showed that the microwave extraction method not only had higher extraction yield, but also had faster extraction speed and higher extraction efficiency than the conventional ethanol extraction method and acetone extraction method.

Capsaicin is the main source of pungent taste and drug function in many components of pepper, and its content is generally 2% - 5% (W / W). In order to improve the utilization rate of hot pepper and give full play to its medicinal function, many extraction methods of capsaicin have been studied, including ethanol extraction at room temperature, ethanol reflux extraction, acetone extraction at warm temperature and so on. However, these methods have shortcomings such as long extraction time and low efficiency. The extraction technology of capsaicin in chili drying equipment was studied in this paper. The extraction efficiency was compared with that of ethanol extraction and acetone extraction. The capsaicin content was analyzed by high performance liquid chromatography (HP L C). Chromatographic conditions: detection wavelength 230n m, mobile phase 75% (V zV) methanol-water solution, flow rate 1.Om l/m I n, capsaicin chromatographic retention time i s s m i n 18 s. O IR e n t M D S-9000 microwave digestion system with PTFE sealed digestion tank; W a t e SR high performance liquid chromatography system, including W a t e SR 510 pump, W a t e SR U 6K injection valve, W a t er s 444 UV-Vis spectrophotometric detector column 4.1/301n, Erlin B o n d p AK C, 8 Column; automatic desktop recorder; type 800 centrifuge.

Methanol, 95% ethanol, pepper, capsaicin standard. Dry pepper seeds, crushed with a food agitator, weighed 209 in a polytetrafluoroethylene tank, 101 Sichuan 65% ethanol (V / V) added, sealed, placed in a microwave digestion system, extracted at 25OW,! 20 kP a. The optimization of microwave extraction conditions mainly includes extraction power, extraction time, extraction pressure and solvent selection. As capsaicin is a thermolabile phthalocyanine compound, it is easy to volatilize and lose at higher temperatures. Therefore, high extraction power, long extraction time or excessive extraction pressure may lead to the reduction of extraction yield.

The effect of microwave power on the yield of capsaicin extraction was investigated by preliminary selection of extraction pressure 120 kP a, extraction time 1205 and 95% V/V ethanol as solvent.

The extraction yield of capsaicin increases with the increase of extraction power when the extraction power is lower than 20 W, and reaches the highest when the extraction power is higher than 20 OW. Therefore, the power of microwave extraction is 2 5OW. When the extraction power is fixed, the extraction time is controlled to control the degree of heating, so that the extraction can be carried out at the optimum temperature to obtain the maximum extraction yield. The effect of extraction time on extraction yield was investigated with 95% ethanol as extraction solvent at 250 W extraction power and 120 kP a pressure. Under the above conditions, the extraction yield reached the highest when the extraction time was 80-1405, and then decreased slightly with the extension of microwave heating time. Therefore,

choose 1205 as the best extraction time of this experiment.

Microwave extraction requires that the solvent must have a certain polarity to absorb microwave energy for internal heating, followed by the selected solvent must have a strong solubility of the target extract. Considering the properties of capsaicin and its edible and medicinal functions, we chose non-toxic, cheap and easy-to-obtain ethanol as the extraction solvent. Under the conditions of extraction pressure 120K P a, power 25OW and extraction time 1205, the change of capsaicin extraction yield with different concentration of ethanol as the extraction solvent was studied. . The extraction yield of capsaicin increased with the increase of ethanol concentration, and reached the highest at 50% to 80%. After that, the extraction yield decreased with the decrease of water content in the extraction solvent. A certain amount of moisture (or a certain humidity) in the sample is helpful to improve the yield of microwave extraction. Because the pepper sample used in this experiment is relatively dry, 65% ethanol can be selected as the extraction solvent to achieve the best extraction effect. The extraction experiments of pepper samples with different degree of drying also showed that the highest extraction yield could be obtained only when the concentration of ethanol was high (such as 95% ethanol). In general open systems, the boiling point of solvents is affected by atmospheric pressure, while microwave extraction is usually carried out in a closed polytetrafluoroethylene tank. For example, at atmospheric pressure, the boiling point of ethanol is 78 degrees Celsius, while at 12 atmospheric pressure in a closed container, the temperature of ethanol can reach 164 degrees Celsius. Therefore, in microwave extraction, the extraction pressure is also an important parameter. It is necessary to control the highest temperature of solvent by controlling the pressure in the closed tank. Under the conditions of extraction power 250W and extraction time 1205, the effects of extraction pressure 12020 A and 30 OkP a on capsaicin extraction were compared. Extraction pressure (kP a) yield of capsaicin (M suck).2 74 row to burn the burn Dan. Effect of ethanol concentration (%, V/ V) 3 ethanol concentration on capsaicin extraction yield

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When the extraction pressure is high and the extraction time is long enough, capsaicin is lost because of the high temperature in the tank, but the extraction yield is reduced. Considering the need for mass production, the experiment was carried out under a 120 kP a near atmospheric pressure. In order to verify the reliability of microwave extraction method, we compared it with ethanol extraction method and acetone extraction method. Several of the dried peppers were treated with standard capsaicin solution of human. 2 Om g, 95% V / Ethanol as extractant, and acetone as extractant at room temperature for 24 hours. The extract was heated for 3 hours in a water bath at 45 C for 3 hours and microwave-assisted extraction for 1205 under the above optimum conditions. After filtration, the capsaicin content was analyzed on HP L C, and the extraction yield and recovery were calculated. Compared with the other two methods, the microwave extraction method has the highest extraction yield, and the recovery rate is also better. Especially noteworthy is that the microwave method can reduce the time consumed from room temperature leaching method of 1 h 8 and acetone temperature leaching method of 3 h to 1205, greatly improving the extraction efficiency.

Conclusion Microwave extraction method has 6 advantages, such as high extraction speed and high extraction efficiency. It has broad application prospects in the extraction of effective components from natural products.