

Effects of supercritical carbon dioxide and pressurized hot water method on the extraction of catechins in tea

連建愷(5143)

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Outline

1. Introduction
2. Optimization of sequential supercritical fluid extraction of caffeine and catechins from green tea
3. Semi-continuous pressurized hot water extraction of black tea
4. Conclusion

Abstract

Catechins are receiving great interest for their potential benefits on human health. There are eight commonly reported catechins, namely, catechin (C), catechin gallate (CG), gallocatechin (GC), gallocatechin gallate (GCG), epicatechin (EC), epicatechin gallate (ECG), epigallocatechin (EGC), and epigallocatechin gallate (EGCG). Many methods are available for the extraction of catechins from green, black and oolong tea, but whichever the method is used, the aqueous extract contains both caffeine and catechins. In general, the separation of caffeine from the aqueous mixture is performed by chloroform, which is a highly toxic solvent. Thus, this study aimed to investigate green extraction methods, such as supercritical fluid extraction (SFE) and pressurized hot water extraction (PHWE) on the effects of catechins extraction in tea. The SFE of caffeine and catechins was conducted at different pressures, temperatures, extraction periods and ethanol modifier flow rates. Optimum conditions for caffeine extraction were 25 MPa pressure at 60 °C for 3 hr extraction period, for catechins were 25 MPa pressure and 60 °C temperature for 3 hr extraction period using ethanol modifier at 0.5 mLmin⁻¹. Caffeine extract yields and purity were optimized for a successful separation. The PHWE was investigated in the conditions of various temperatures (120-180 °C) and water flow rates (6-18 mLmin⁻¹). The optimum conditions were found to be 160 °C and 12 mL min⁻¹. Compare to the traditional tea brewing method, PHWE can achieve significantly higher extraction yields of theophylline, caffeine, C, and GCG. In conclusion, the SFE method can completely remove caffeine in tea. The PHWE method showed shorter catechins extraction periods than the SFE method in tea. Both the SFE and PHWE methods have the potential for food industrial applications.

1 一、 参考文献

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