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Paeonol Content in the Decoction of Moutan Cortex Infused with Another Crude Drug

ZHI ZHONG FANG,[a] FUMIHIKO YOSHIZAKI*,[b] and SHUJI HISAMICHI[b]

[a]*Department of Pharmacology, Tianjin 2nd Medical College, No. 1 Kuang Tong Road, Hexi District, Tianjin P.R., China*
[b]*Tohoku College of Pharmacy, 4–4–1 Komatsushima, Aoba-ku, Sendai 981, Japan*

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The influence of coexisting crude drugs on the extraction of paeonol from Moutan Cortex into the decoction was studied.

Each of the 46 crude drugs to be tested was decocted with Moutan Cortex and the paeonol content in the decoction was estimated by gas-liquid chromatography after the pretreatment with Amberlite XAD-2. No crude drug notably changed the paeonol content in the decoction.

Keywords——Moutan Cortex; paeonol; decoction; gas-liquid chromatography; pharmaceutical analysis

The influence of coexisting crude drugs on the extraction of principal constituents of a particular crude drug into the decoction has not been extensively studied.[1,2]

In this work, we chose paeonol in Moutan Cortex which is a volatile compound and established a method of determination of its content in the decoction of Moutan bark by employing Amberlite XAD-2 resin. By the use of this procedure, the effect of codecocted crude drugs (46 kinds of crude drugs which are contained in the 19 prescriptions containing Moutan Cortex) on the paeonol content in the decoctions was investigated.

Experimental

Materials——Chopped crude drugs were purchased from Nakaikohshindo (中井廣進堂, Kobe). All of the crude drugs used, except those marked with a–f in TABLE II, correspond to those defined by JP XI and the Latin representations given also conform to JP XI. Paeonol was prepared from a chloroform extract of Moutan barks by silicic acid column chromatography using dichloromethane as eluent and recrystallization from dichloromethane–methanol, mp. 49–49.5°C.[3]

Gas-liquid chromatography——The conditions used were as follows: machine, Yanaco G 3810; column, 3% Silicone OV-17 on Chromosorb W(AW); glass column (3 mm×3 m); column temp., 170°C; detec. temp., 200°C; N_2, 30 ml/min; detec., FID.

Determination procedure——4 g of minced Moutan bark and 4 g of a crude drug to be tested were decocted in a beaker (500 ml) with 400 ml of water for 30 min using an electric heater (600 W) and filtered. After 30 min decoction, the volume of the infused solution was slightly less than 200 ml. After cooling, the filtrate was made to 200 ml with water. 100 ml of the solution was applied to an Amberlite XAD-2 column (80 ml), and the column was washed with water (200 ml) and methanol (100 ml) successively, and then eluted with 200 ml of acetone. The eluate was concentrated *in vacuo* and made to 5 ml with acetone. 5 μl of the solution was injected into the gas-liquid chromatography (GLC) machine. The paeonol content in each sample was calculated by comparing the peak area (expressed as count number by SIC Chromatocorder 12) in the test solution with that of an authentic standard.

Results and Discussion

3% Silicone OV-17 was used for GLC[4] and the calibration curve was prepared by the regression equation derived from the method of least squares as described below, $y=5251.373x+3055.728$ ($r=0.999$) [x is the amount (μg) of the compound and y is the count number on the chromatogram].

TABLE I. Recovery of Added Paeonol in Moutan Cortex Decoctions

	Added (mg)	Found (mg)	Recovery	
			(mg)	(%)
1	0	4.081		
2	3.225	7.231	3.150	97.7
3	3.105	7.133	3.052	98.3
4	3.033	7.025	2.944	97.1
5	2.897	6.712	2.631	90.8
6	2.991	7.202	3.121	104.3
7	2.830	6.812	2.731	96.5
Mean				97.5

The average rate of recovery of authentic paeonol when it was added to the other half of the decoction of Moutan Cortex (4 g) and applied to an Amberlite XAD-2 column was 97.5% as shown in TABLE I. Therefore, the utilization of this resin can be said to provide an ingenious method for the assay of paeonol in the decocted solutions of Moutan Cortex.

The paeonol content in this Moutan bark assayed by using high-performance liquid chromatography[5] has been reported to be 2.03%.[3] The paeonol contents in the infused solutions of Moutan Cortex decocted with various crude drugs are shown in TABLE II. The content was the lowest when decocted with Carthami Flos (69.5%), no codecocted crude drug decreased the paeonol content below 60% (60> relative content[2]). The paeonol content was slightly decreased (90>relative content[2] ≧60) by 21 crude drugs and slightly increased (relative content[2]>110) by one crude drug. 23 crude drugs had no influence (110≧relative content[2]≧90) on the paeonol content.

In the case of Glycyrrhizae Radix decoctions, 4 crude drugs markedly decreased the glycyrrhizin content in the decoctions.[2] However, no codecocted crude drugs exerted considerable influence on the extraction of paeonol from Moutan Cortex. Further investigations on the various constituents of the many kind of crude drugs are expected.

References and Notes

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TABLE II. Paeonol Content in Decoction of Moutan Cortex Infused with Other Crude Drugs

Coinfused crude drugs	Content (%)	Relative content (%)
None [Moutan Cortex (牡丹皮) only]	0.190	100.0
Bupleuri Radix (柴胡)	0.213	112.1
Plantaginis Semen (車前子)	0.201	105.8
Asini Gelatinum[a] (阿膠)	0.198	104.2
Alismatis Rhizoma (沢瀉)	0.196	103.2
Angelicae Dahuricae Radix (白芷)	0.187	98.4
Corydalis Tuber (延胡索)	0.187	98.4
Glycyrrhizae Radix (甘草)	0.186	97.9
Coicis Semen (薏苡仁)	0.184	96.8
Ginseng Radix (人参)	0.184	96.8
Zizyphi Fructus (大棗)	0.182	95.8
Pinelliae Tuber (半夏)	0.181	95.3
Aconiti Tuber Praeparata[b] (炮附子)	0.180	94.7
Paeoniae Radix (芍薬)	0.180	94.7
Dioscoreae Rhizoma (山薬)	0.180	94.7
Evodiae Fructus (呉茱萸)	0.179	94.2
Atractylodis Lanceae Rhizoma (蒼朮)	0.178	93.7
Rhei Rhizoma (大黄)	0.177	93.2
Talcum (滑石)	0.176	92.6
Anemarrhenae Rhizoma (知母)	0.175	92.1
Cinnamomi Cortex (桂枝)	0.174	91.6
Cyperi Rhizoma (香附子)	0.174	91.6
Hoelen (茯苓)	0.173	91.1
Benincasae Semen[c] (冬瓜子)	0.172	90.5
Phellodendri Cortex (黄柏)	0.172	90.5
Polygalae Radix (遠志)	0.171	90.0
Saussureae Radix (木香)	0.170	89.5
Ophiopogonis Tuber (麦門冬)	0.169	88.9
Aurantii Nobilis Pericarpium (陳皮)	0.169	88.9
Natrii Sulfas[d] (芒硝)	0.166	87.4
Astragali Radix (黄耆)	0.166	87.4
Aurantii Fructus Immaturus (枳実)	0.165	86.8
Achyranthis Radix (牛膝)	0.163	85.8
Zizyphi Spinosi Semen[e] (酸棗仁)	0.163	85.8
Cnidii Rhizoma (川芎)	0.161	84.7
Gardeniae Fructus (山梔子)	0.160	84.2
Schisandrae Fructus (五味子)	0.159	83.7
Corni Fructus (山茱萸)	0.158	83.2
Zingiberis Rhizoma (生姜)	0.157	82.6
Linderae Radix[f] (烏薬)	0.154	81.1
Angelicae Radix (当帰)	0.145	76.3
Persicae Semen (桃仁)	0.144	75.8
Atractylodis Rhizoma (白朮)	0.143	75.3
Menthae Herba (薄荷)	0.141	74.2
Scrophulariae Radix[g] (玄参)	0.141	74.2
Rehmanniae Radix (地黄)	0.134	70.5
Carthami Flos (紅花)	0.132	69.5

[a] Glue prepared from the skin of *Equus asinus*. [b] Tuberous root of *Aconitum* species treated for reduction in virulence. [c] Seed of *Benincasa cerifera*. [d] $Na_2SO_4 \cdot 10\,H_2O$. [e] Seed of *Zizyphus jujuba* var. *spinosa*. [f] Root of *Lindera strychnifolia*. [g] Root of *Scrophularia ningpoensis*.