Simultaneous Determination of 12 Components in Longqing Capsule by QAMS

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Abstract [**Objectives**] To establish a multi-indicator quality control method for the retention of Longqing Capsule based on the principle of prescription of Chinese medicine. [**Methods**] High performance liquid chromatography (HPLC) with ShimNex CS C_{18} as the column; column temperature: 35 ℃; wavelength: 270 nm; methanol-0.1% phosphoric acid solution as the mobile phase with gradient elution. [**Results**] The 12 components of the retention of Longqing Capsule showed good linearity within the investigated range ($r \geqslant 0.999\,5$), with the average spiked recoveries of 97.83% - 100.52% and the *RSD* of 0.9% - 2.1%. [**Conclusions**] The method is exclusive, sensitive, reproducible, simple and easy to use, and can provide a reference for the construction of the quality standard and control system of Longqing Capsule based on the theory of traditional Chinese medicine.

Key words Longqing Capsule, Chemical component, Content determination, Quantitative analysis of multi-components by single marker (QAMS)

1 Introduction

Longqing Capsule is a national improved new drug, originated from the *Interpretation of Clinical Path Therapeutic Drugs*[1]. It consists of 10 traditional Chinese medicines, such as sepsis, white-flower snakeweed, honeysuckle, yellow cypress, cyperus, Moutanpi, red peony, and senna, *etc.* Longqing Capsule is effective in clearing away heat and detoxification, cooling the blood and clearing the flow of gonorrhea and mainly used for the feverish gonorrhea due to the dampness and heat of the lower burner, symptomatic of frequent urination and lumbar pain. Currently, the alkaloids such as berberine hydrochloride and cyperine hydrochloride are mainly used as the quality control indicators[2-3], and Chinese medicine treatment is derived from the identification of evidence and the properties of traditional Chinese medicines, the main component of the formula, caffeic acid, has the effect of clearing heat and detoxification[4-8]; rutin and kaempferol in the ministerial herb White Flower Snake Tongue Herb have the effect of inducing diuresis and seepage of dampness[9-10]. Berberine hydrochloride and phellodendrine chloride in Phellodendron Bark have the effects of clearing heat and removing toxins and destroying fire[11-14]; chlorogenic acid in honeysuckle has the effects of detoxification and anti-inflammation[15-17]; *Paeoniae lactiflora* and its component paeoniflorin in *Paeoniae japonicae* have the effects of activating blood circulation and removing blood stasis and resolving fever and spasms[18-19]; the main component of Mudanpi, paeonol, has the effects of stopping bleeding and removing blood stasis[20-21]; and *Xanthium officinale*, its constituent luteolin, has the functions of anti-inflammation and detoxification[22-23], the above index components all coincide with the efficacy of the main treatment of the formula, in order to further reflect the main disease of the main drug, the subject drug to help the main drug to clear the heat and clear the drenching, the adjuvant not only to help the main drug, but also to treat the symptoms, to achieve the combined use of all the medicines, and to play the role of clearing the heat and removing toxins, cooling the blood and clearing the drenching. Therefore, this experiment utilized the QAMS to simultaneously determine the 12 saponins, flavonoids, alkaloids, organic acids, and other components of paeoniflorin, paeonol, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin, and phellodendrine chloride in the retention of Longqing Capsule, so as to provide a basis for the further improvement of the quality control of retention of Longqing Capsule.

2 Materials and instruments

2.1 Instruments Agilent 1100 High Performance Liquid Chromatograph (Agilent Technologies Ltd.); Agilent 1260 High Performance Liquid Chromatograph (Agilent Technologies Ltd.); Diamonsil C_{18} column (4.6 mm × 250 mm, 5 μm); ShimNex CS C_{18} column (4.6 mm × 250 mm, 5 μm); AL-104 electronic balance (METTLER TOLEDO); Discovery DV215CD analytical balance (Shanghai Ohaus Instrument Co., Ltd.); KQ5200 ultrasonic cleaner (Beijing Innovative De Ultrasonic Electronics Research Institute).

2.2 Drugs and reagents Paeoniflorin (batch No.: wkq18032-104), paeonol (batch No.: 11708-200506), chlorogenic acid (batch

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No.: wkq23022707), caffeic acid (batch No.: 110885-200102), berberine hydrochloride (CO2515160405), coptisine (batch No.: wkq23030705), jatrorrhizine hydrochloride (batch No.: wkq22102601), gallic acid (batch No.: wkq19010307), rutin (wkq17051605), kaempferol (batch No.: wkq19011609), luteolin (batch No.: wkq23021710), and phellodendrine chloride (batch No.: wkq23032109) control. Longqing Capsule (0.5 g/capsule, batch No.: 20220203, 20220506, 20220815) was provided by Guizhou Yuancheng Pharmaceutical Co. Acetonitrile, methanol (chromatographic purity, Tianjin Komeo Chemical Reagent Co., Ltd.), water was pure water, and the rest of the reagents were analytically pure.

3 Methods and results

3.1 Chromatographic conditions Column: ShimNex CS C_{18} (4.6 mm×250 mm, 5 μm); Column temperature: 35 ℃; the detection wavelength: 270 nm; mobile phase: 0.1% phosphoric acid (A)-methanol (B) solution and the gradient elution are illustrated in Table 1; volumetric flow rate: 1.0 mL/min, and injection volume: 10 μL (Table 1).

Table 1 Gradient elution programs

Time//min	0.1% phosphoric acid (A)//%	Methanol (B)//%
0–15	93.0–90.0	7.0–10.0
15–20	90.0–83.0	10.0–17.0
20–25	83.0–80.0	17.0–20.0
25–50	80.0–75.0	20.0–25.0
50–70	75.0–72.0	25.0–28.0
70–90	72.0–58.0	28.0–42.0
90–110	58.0–30.0	42.0–70.0

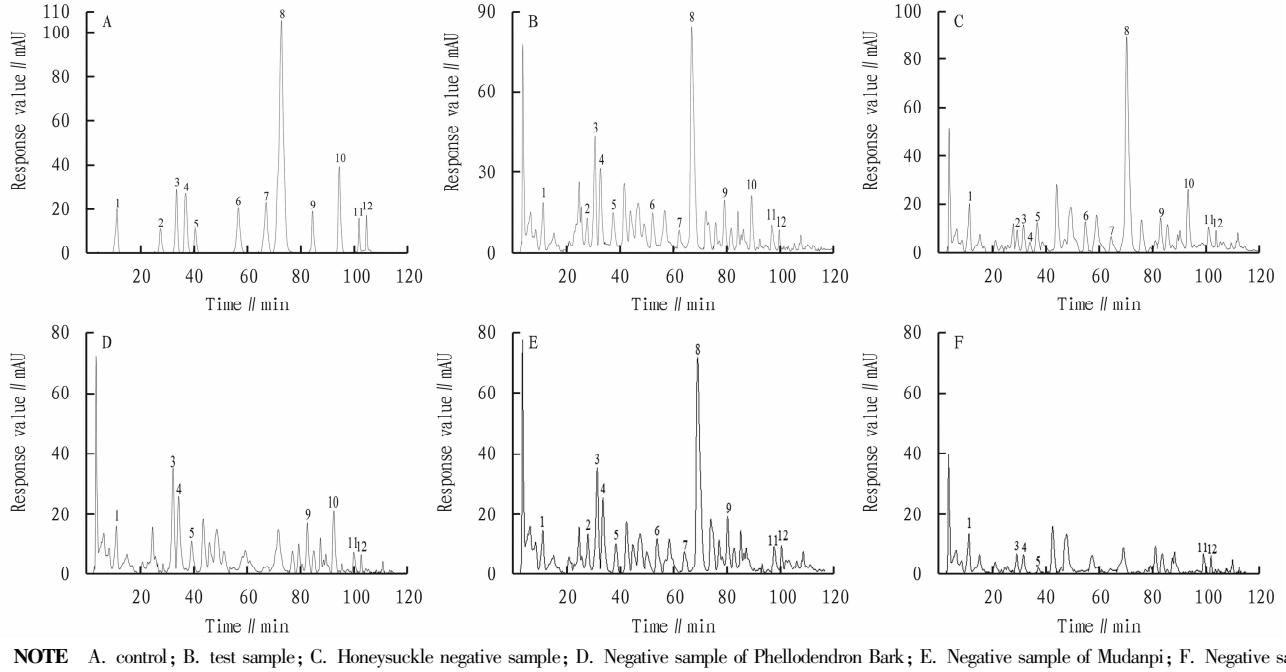
3.2 Preparation of solutions

3.2.1 Mixed control solution. Appropriate amount of the control product was weighed precisely, and methanol was added to make a mixed control solution containing paeoniflorin 0.174 mg/mL, paeonol 0.007 mg/mL, chlorogenic acid 0.160 mg/mL, caffeic acid 0.037 mg/mL, berberine hydrochloride 0.166 mg/mL, coptisine 0.028 mg/mL, jatrorrhizine hydrochloride 0.027 mg/mL, gallic acid 0.069 mg/mL, rutin 0.029 mg/mL, kaempferine 0.004 mg/mL, luteolin 0.006 mg/mL, and phellodendrine chloride 0.110 mg/mL.

3.2.2 Test solution. Take the appropriate amount of retention of Longqing Capsule, pulverize, take about 1.0 g, precision weighing, placed in a stoppered conical flask, accurately add methanol 100 mL, weighing, ultrasonic 30 min, cooling, with methanol to make up the weight, shaking, filtration, that is to obtain.

3.2.3 Negative control solution. According to the prescription process of retention of Longqing Capsule and *Chinese Pharmacopoeia*[2], the negative samples were prepared according to the method of Section **3.2.2** for the absence of Honeysuckle, Mudanpi, Huanglian and Phellodendron Bark, and Honeysuckle, Mudanpi, Huanglian and Phellodendron Bark, respectively.

3.3 System applicability and exclusivity test According to the chromatographic conditions of Section **3.1**, the samples were injected for determination, and the results are shown in Fig. 1, which shows that the chromatographic peaks of the 12 components were completely separated, and all of them were free of interference, indicating that the method has good exclusivity.



NOTE A. control; B. test sample; C. Honeysuckle negative sample; D. Negative sample of Phellodendron Bark; E. Negative sample of Mudanpi; F. Negative sample of Honeysuckle, Rhizoma Coptidis, Rhizoma Pinelliae and Rhizoma Mudanensis; 1. gallic acid; 2. phellodendrine chloride; 3. chlorogenic acid; 4. caffeic acid; 5. paeoniflorin; 6. coptisine; 7. jatrorrhizine hydrochloride; 8. berberine hydrochloride; 9. luteolin; 10. paeonol; 11. rutin; 12. kaempferol.

Fig. 1 HPLC diagram of each component

3.4 Methodological examination

3.4.1 Precision test. Take 6 portions of the mixed control solution, according to Section **3.1** chromatographic conditions for determination, the results were measured paeoniflorin, paeonol, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin, phellodendrine chloride, respectively, the *RSD* of the peak area of the chromatographic peaks 1.5%, 1.4%, 0.59%, 1.1%, 1.47%, 1.3%, 1.2%, 0.91%, 1.1%, 0.53%, 1.3%, 1.3%, indicating that the precision of the instrument is good.

3.4.2 Repeatability test. The same batch of Longqing Capsule was taken, and 6 test solutions were prepared in parallel according to the method of Section **3.2.2**, and the samples were injected into the sample for determination according to the chromatographic conditions of Section **3.1**, and the results showed that paeoniflorin, paeonol, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin, phellodendrine chloride were the main ingredients, The *RSD*s of gallic acid, rutin, kaempferol, lignocerotoxin and cyperus rotundus hydrochloride were 1.0%, 0.60%, 1.4%, 0.65%, 1.2%, 0.96%, 1.6%, 0.95%, 1.1%, 0.56%, 0.81%, 1.5%, respectively, which indicated that the method was reproducible.

3.4.3 Stability test. The same batch of retention of Longqing Capsule was made into test solution according to the method of Section **3.2.2**, and the samples were injected into the sample for determination according to the chromatographic conditions of Section **3.1** at 0, 4, 8, 12 and 24 h. The results of the stability test showed that paeoniflorin, paeonol, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin, phellodendrine chloride were all stable. As a result, the *RSD* of the peak areas of paeoniflorin, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin and phellodendrine chloride were 1.2%, 0.75%, 1.2%, 0.84%, 1.0%, 0.99%, 1.8%, 0.53%, 0.34%, 1.4%, 1.3%, 0.89%, respectively, which indicated that the test solutions were stable within 24 h.

3.4.4 Examination of linear relationship. Appropriate amount of the mixed control solution was sucked up, diluted with 6 different concentrations, and measured according to the chromatographic conditions in Section **3.1**, and regressed on the sample amount of each control (X, μg) as the horizontal coordinate and the peak area Y as the vertical coordinate. The results are shown in Table 2, from which it can be seen that the linearity of each component was good within the detection limit ($r \geqslant 0.999\ 5$).

Table 2 Results of linear relationships of various constituents

Components	Regression equation	Linear range // μg/mL	r
Paeoniflorin	$Y = 4.113X + 1.223\ 9$	17.431 7 – 174.317 0	0.999 8
Paeonol	$Y = 319.56X + 2.205\ 3$	0.738 8 – 7.387 9	0.999 9
Chlorogenic acid	$Y = 10.408X - 2.267\ 7$	16.048 8 – 160.487 8	0.999 7
Caffeic acid	$Y = 54.273X + 14.849$	3.735 1 – 37.351 3	0.999 5
Berberine hydrochloride	$Y = 76.455X + 49.116$	16.634 5 – 166.345 2	0.999 6
Coptisine	$Y = 73.425X + 8.187\ 9$	2.857 7 – 28.576 6	0.999 8
Jatrorrhizine hydrochloride	$Y = 90.798X + 0.927\ 7$	2.775 7 – 27.756 5	0.999 5
Gallic acid	$Y = 18.71X + 6.10$	6.925 8 – 69.258 3	1.000 0
Rutin	$Y = 31.849X + 8.034\ 5$	2.983 7 – 29.836 7	0.999 5
Kaempferol	$Y = 115.85X - 0.234\ 8$	0.443 6 – 4.436 2	0.999 8
Phellodendrine chloride	$Y = 3.7898X + 1.191\ 3$	11.045 0 – 110.449 4	0.999 5
Luteolin	$Y = 83.433X + 0.702\ 4$	0.624 6 – 6.246 3	0.999 7

3.4.5 Sample recovery test. Precisely weigh the same batch of the product with known content of each ingredient, 6 parallel portions, about 0.5 g each, placed in a stoppered conical flask, and were added at the amount equivalent to 80%, 100% and 120% of the amount of paeoniflorin, paeonol, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin, phellodendrine chloride, respectively, and then add the control product (3 portions each with different addition amounts), according to the method in Section **3.2.2** to prepare the test solution, according to Section **3.1** chromatographic conditions into the sample for determination, record the peak area of each component, calculate the average spiked recoveries of 99.36%, 98.32%, 97.83%, 98.09%, 99.93%, 100.52%, 98.93%, 99.51%, 99.24%, 99.85%, 100.05%, 99.24% and the *RSD*s were 1.3%, 1.9%, 2.1%, 1.9%, 1.7%, 2.1%, 1.5%, 1.8%, 1.9%, 1.4%, 0.9%, 1.9%, the results showed that the spiked recoveries of the 12 components were good, which basically met the requirements of the test methodology.

3.5 Calculation of correlation correction factor Take the control solution in Section **3.2.1**, inject the sample according to the chromatographic conditions in Section **3.1**, and use berberine hydrochloride as the control, and calculate the relative correction factor RCF ($f_{k/s}$), the formula is $f_{k/s} = f_k/f_s = (C_k A_s)/(C_s/A_k)$, where C_k is the content of other components, A_k is the peak area of other components, C_s is the content of the internal standard, A_s is the peak area of the internal standard, and the results are shown in Table 3 ($RSD < 2.8\%$).

Table 3 Relative correction factors of various constituents ($n=6$)

No.	$f_{S/A}$	$f_{S/B}$	$f_{S/C}$	$f_{S/D}$	$f_{S/E}$	$f_{S/F}$	$f_{S/G}$	$f_{S/H}$	$f_{S/I}$	$f_{S/J}$	$f_{S/K}$
1	0.3078	0.086 5	0.287 6	1.033 8	0.192 7	0.637 8	0.352 7	0.711 5	4.286 6	1.429 7	1.242 5
2	0.305 9	0.082 5	0.286 9	1.031 0	0.198 9	0.631 2	0.333 6	0.716 7	4.283 4	1.425 6	1.241 0
3	0.310 5	0.083 7	0.277 7	1.037 5	0.189 7	0.641 5	0.343 2	0.720 1	4.286 5	1.423 4	1.240 5
4	0.305 7	0.088 7	0.291 0	1.039 8	0.195 6	0.635 7	0.355 8	0.718 8	4.280 4	1.431 0	1.239 8
5	0.312 3	0.085 1	0.286 3	1.034 9	0.197 8	0.638 9	0.357 8	0.709 8	4.286 1	1.428 8	1.244 5
6	0.309 2	0.086 8	0.284 1	1.035 5	0.191 1	0.639 3	0.358 6	0.710 5	4.289 1	1.430 5	1.242 1
Mean	0.308 6	0.085 6	0.285 6	1.035 4	0.194 3	0.637 4	0.350 3	0.714 6	4.285 4	1.428 2	1.241 7
RSD//%	0.85	2.6	1.6	0.29	1.9	0.56	2.8	0.63	0.071	0.21	0.14

NOTE S, A-K are berberine hydrochloride, gallic acid, phellodendrine chloride, chlorogenic acid, caffeic acid, paeoniflorin, coptisine, jatrorrhizine hydrochloride, luteolin, paeonol, rutin, kaempferol. The same below.

3.6 Examination of durability

3.6.1 Instruments and chromatographic columns. Take the control solution in Section **3.2.1**, investigate with Aglient 1100 and Aglient 1260 chromatographs and Shim Nex CS C_{18} (4.6 mm×250 mm, 5 μm), Diamonsil C_{18} (4.6 mm×250 mm, 5 μm), Spherisord C_{18} (4.6 mm×250 mm, 5 μm) columns on the relative correction factors of each component were investigated separately, and the results were shown in Table 4, which showed that none of them had significant effects (*RSD*<1.8%).

Table 4 Effects of different instruments and columns on relative correction factors

Instrument	Chromatographic columns	$f_{S/A}$	$f_{S/B}$	$f_{S/C}$	$f_{S/D}$	$f_{S/E}$	$f_{S/F}$	$f_{S/G}$	$f_{S/H}$	$f_{S/I}$	$f_{S/J}$	$f_{S/K}$
Aglient 1100	Shim Nex CS C_{18}	0.306 9	0.086 9	0.287 3	1.034 5	0.197 7	0.637 6	0.356 6	0.711 5	4.288 6	1.429 7	1.246 6
	Diamonsil C_{18}	0.305 7	0.085 5	0.286 6	1.032 2	0.199 9	0.638 3	0.353 6	0.716 7	4.282	1.420 2	1.239 7
	Spherisord C_{18}	0.306 3	0.087 1	0.285 7	1.036 9	0.194 9	0.640 2	0.348 1	0.720 1	4.289 1	1.419 8	1.248 2
Aglient 1260	Shim Nex CS C_{18}	0.307 9	0.083 9	0.290 1	1.039 1	0.198 2	0.639 1	0.357 9	0.718 8	4.279 5	1.431 2	1.246 7
	Diamonsil C_{18}	0.310 3	0.088 4	0.286 3	1.038 3	0.196 6	0.636 6	0.350 2	0.709 8	4.282 9	1.428 8	1.240 5
	Spherisord C_{18}	0.308 9	0.086 3	0.283 7	1.035 1	0.192 5	0.637 4	0.359 9	0.710 5	4.288 8	1.436 6	1.235 6
Mean	–	0.307 7	0.086 4	0.286 6	1.036 0	0.196 6	0.638 2	0.354 4	0.714 6	4.285 2	1.427 7	1.242 9
RSD//%	–	0.56	1.8	0.73	0.25	1.3	0.20	1.3	0.63	0.10	0.46	0.40

3.6.2 Chromatographic peak localization. The relative retention time method was adopted, and the retention time of the control solution in Section **3.2.1** was measured on the instrument and column in Section **3.6.1**, and the relative retention time t_i/s was calculated, and the results are shown in Table 5, which showed that there was no significant change(*RSD*<1.2%).

Table 5 Effects of different instruments and columns on relative retention time

Instrument	Chromatographic columns	$t_{S/A}$	$t_{S/B}$	$t_{S/C}$	$t_{S/D}$	$t_{S/E}$	$t_{S/F}$	$t_{S/G}$	$t_{S/H}$	$t_{S/I}$	$t_{S/J}$	$t_{S/K}$
Aglient 1100	Shim Nex CS C_{18}	0.389 7	0.465	0.494 5	0.560 2	0.781 9	0.917 2	0.157 8	1.165 1	1.302 9	1.405 5	1.450 6
	Diamonsil C_{18}	0.379 9	0.459 9	0.496 6	0.550 5	0.780 8	0.913 5	0.157 5	1.165	1.305 3	1.410 9	1.449 1
	Spherisord C_{18}	0.384 2	0.464 5	0.495 1	0.561 1	0.782 5	0.901 6	0.157 7	1.164 9	1.308 3	1.409 1	1.447 3
Aglient 1260	Shim Nex CS C_{18}	0.388 1	0.468 9	0.494 8	0.568 5	0.781 1	0.917 7	0.158	1.164 8	1.309 6	1.410 5	1.448 9
	Diamonsil C_{18}	0.389 1	0.465 1	0.492 6	0.560 3	0.782 2	0.902 5	0.158 2	1.165 3	1.310 5	1.419 8	1.436 5
	Spherisord C_{18}	0.386 6	0.465 4	0.494 5	0.551 6	0.780 3	0.916 6	0.157 6	1.158	1.312 1	1.411 1	1.440 5
Mean	–	0.386 3	0.464 8	0.494 7	0.558 7	0.781 5	0.911 5	0.157 8	1.163 9	1.308 1	1.411 2	1.445 5
RSD//%	–	0.96	0.62	0.26	1.2	0.11	0.82	0.17	0.25	0.26	0.33	0.39

3.7 Determination of sample content Three batches of Longqing Capsule were prepared according to the method of Section **3.2.2**, and analyzed according to the chromatographic conditions in Section **3.1**, and the content and relative error (RAD) were calculated by the external standard method and the QAMS, respectively, and the results are shown in Table 6. It can be seen that the results of the two methods were similar, indicating that the QAMS can be used for the determination of the content.

Table 6 The amount of the component to be measured in the sample (mg/g, $n=3$)

Compound	20220714			20220506			20220815		
	ESM	QAMS	RAD//%	ESM	QAMS	RAD//%	ESM	QAMS	RAD//%
Berberine hydrochloride	4.816 6	–	–	4.7946	–	–	4.9782	–	–
Gallic acid	2.247 9	2.248 8	0.04	2.010 8	2.009 3	−0.07	2.159 7	2.158 4	−0.06
Phellodendrine chloride	1.072 9	1.069 7	−0.30	1.005 7	1.010 8	0.51	1.120 8	1.123 5	0.24
Chlorogenic acid	5.139 6	5.140 3	0.01	4.761 5	4.762 8	0.03	4.971 9	4.969 7	−0.04
Caffeic acid	1.712 7	1.714 2	0.09	1.356 5	1.357 3	0.06	1.597 2	1.598 8	0.10
Paeoniflorin	2.668 1	2.667 3	−0.03	2.498 7	2.499 2	0.02	2.157 6	2.146 5	−0.51
Coptisine	0.336 7	0.338 8	0.62	0.365 5	0.366 2	0.19	0.398 8	0.400 1	0.33
Jatrorrhizine hydrochloride	0.976 1	0.976 9	0.08	0.964 2	0.963 4	−0.08	0.914 6	0.915 8	0.13
Rutin	0.512 1	0.511 4	−0.14	0.501 7	0.500 9	−0.16	0.522 1	0.528 5	1.23
Paeonol	0.608 5	0.607 3	−0.20	0.679 2	0.681 1	0.28	0.594 3	0.593 9	−0.07
Luteolin	0.535 2	0.535 9	0.13	0.559 7	0.559 1	−0.11	0.546 7	0.546 6	−0.02
Kaempferol	0.147 9	0.148 8	0.06	0.160 9	0.161 8	0.06	0.159 7	0.158 4	−0.08

4 Discussion

4.1 Selection of chromatographic conditions In this experiment, the 12 components of Longqing Capsule were determined simultaneously, during which methanol-water, acetonitrile-water, methanol-0.1% phosphoric acid solution, acetonitrile-0.1% phosphoric acid solution, methanol-0.1% formic acid solution, acetonitrile-0.1% formic acid solution, acetonitrile (0.3% formic acid and 0.3% triethylamine)-water (0.3% formic acid and 0.3% formic acid and 0.3% triethylamine), methanol (0.3% formic acid and 0.3% triethylamine)-water (0.3% formic acid and 0.3% triethylamine) of the eight mobile phases with different proportions of the gradient elution of the separation effect, the results show that methanol-0.1% phosphoric acid solution baseline is relatively smooth, the organic phase methanol elution of the compound peaks of the separation of the best, and the inorganic phase added phosphoric acid, the acidification of the components to be measured peaks reduce the trailing Therefore, methanol-0.1% phosphoric acid solution was chosen as the mobile phase. Since the retention time of each component in reversed-phase chromatography varies greatly, a gradient elution was used after reviewing the literature, so that the peaks of the components to be tested and the neighboring peaks of other impurities could achieve a better separation effect and ensure the smoothness of the baseline.

4.2 Selection of internal standard Berberine hydrochloride is one of the main active ingredients of Cortex Phellodendron Bark, which is stable in nature, high in content, moderate in retention time, cheap and easy to obtain, and the interference peaks near the chromatographic peaks are also less, so it was chosen as the internal standard in this experiment.

4.3 Detection wavelength selection The chromatograms of Longqing Capsule measured in this experiment showed that the order of peaks of 12 components were gallic acid, phellodendrine hydrochloride, chlorogenic acid, caffeic acid, paeoniflorin, coptisine, jatrorrhizine hydrochloride, berberine hydrochloride, luteolin, paeonol, rutin, kaempferol, and the UV scanning was carried out at detection wavelengths of 200 – 400 nm to investigate the chromatograms obtained from the components, and the chromatograms obtained were determined to be in the range of 230, 250, 270 nm have common peaks, but according to the high sensitivity content of the reaction of each component, it was finally determined to choose 270 nm as the detection wavelength.

5 Conclusions

Based on the traditional Chinese medicine theory of "sovereign, minister, assistant and courier", we chose Longqing capsule to carry out the study of multi-indicator content determination, and in this experiment, we used the QAMS to simultaneously determine the 12 components of Longqing Capsule. The results provide a basis for the simultaneous quality control of 12 components in Longqing Capsule, including paeoniflorin, chlorogenic acid, caffeic acid, berberine hydrochloride, coptisine, jatrorrhizine hydrochloride, gallic acid, rutin, kaempferol, luteolin and phellodendrine chloride.

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