

The Comparative Study of Quality between Sheng-Mai-Yin Single and Co-Decoction

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Decoction is the earliest and most popular method of preparing herbal medicines in the practice of traditional Chinese medicine. Different kinds of herbs are mixed together and boiled with water to get decoction, which are usually took by patients themselves. One popular approach nowadays is to prepare water extract of individual herbs in the form of granule. The granule of an individual herb is called a dispensing granule. The application of granules has the advantages of better quality control and easier administration. Now the formula granule had been widely applied in clinic in China, Japan and Korea [1]. However, the chemical constituents of the formula granule and traditional decoction were similar, the contents of some constituents and other diversity comparisons may cause the difference of effectiveness.

Sheng-mai-yin which is composed of *Radix Ginseng*, *Fructus Schisandrae* and *Radix Ophiopogoni* is a famous traditional Chinese

medicine prescription. Many clinical reports have demonstrated the cardio-protective effects of Sheng-mai-yin against heart attack and chronic lesions [2]. However, few chemical comparison has been reported between dispensing granule and traditional decoction of Sheng-mai-yin. Therefore, HPLC-UV and HPLC-ESI-MS were applied to analyze the changes of compositions in each crude drug before and after compatibility. And then, some pharmacodynamics indicators were compared between Sheng-mai-yin dispensing granule and traditional decoction by animal experiments.

The main results were as followed:

The fingerprint of *Ginseng Radix et Rhizoma* in Sheng-mai-yin was established by HPLC-UV and HPLC-ESI-MS. Sheng-mai-yin single and co-decoction were also analyzed under this condition (Figure 1). The

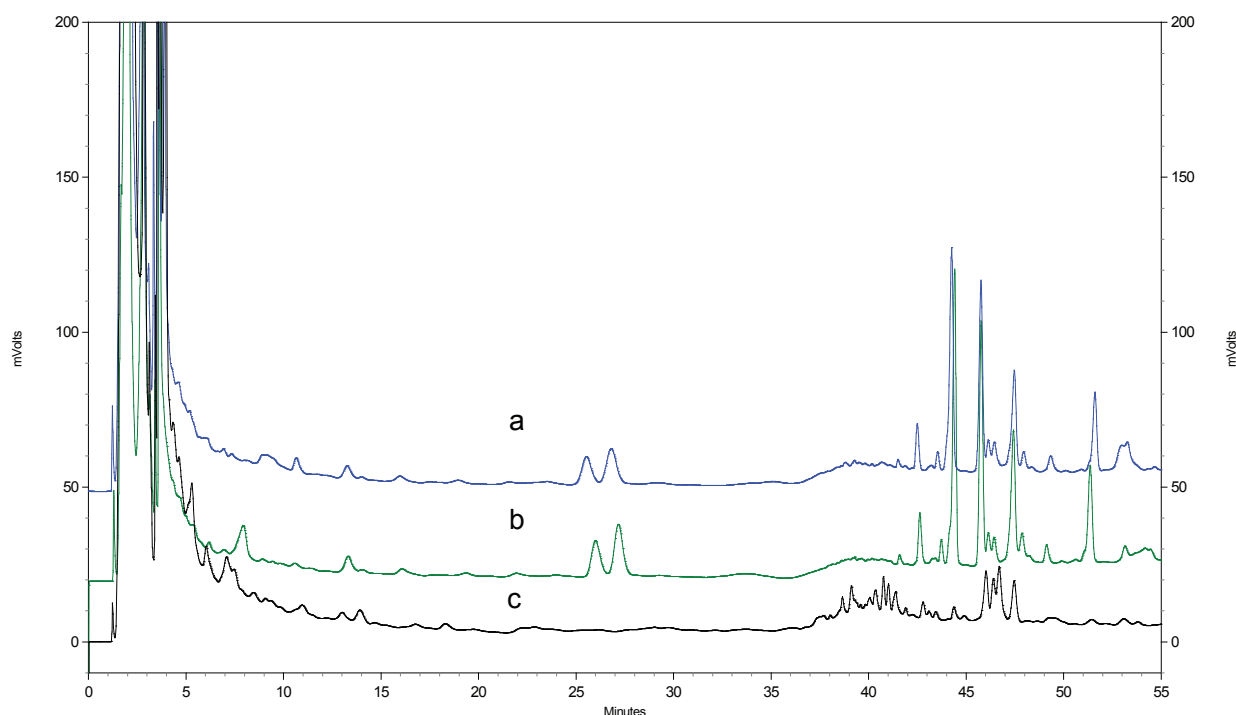


Figure 1: The comparison of chromatograms between *Ginseng Radix et Rhizoma*, Sheng-mai-yin single and Sheng-mai-yin co-decoction with gradient elution program. (a) The separated decoction of *Ginseng Radix et Rhizoma*, (b) The single decoction of Sheng-mai-yin, (c) The co-decoction of Sheng-mai-yin

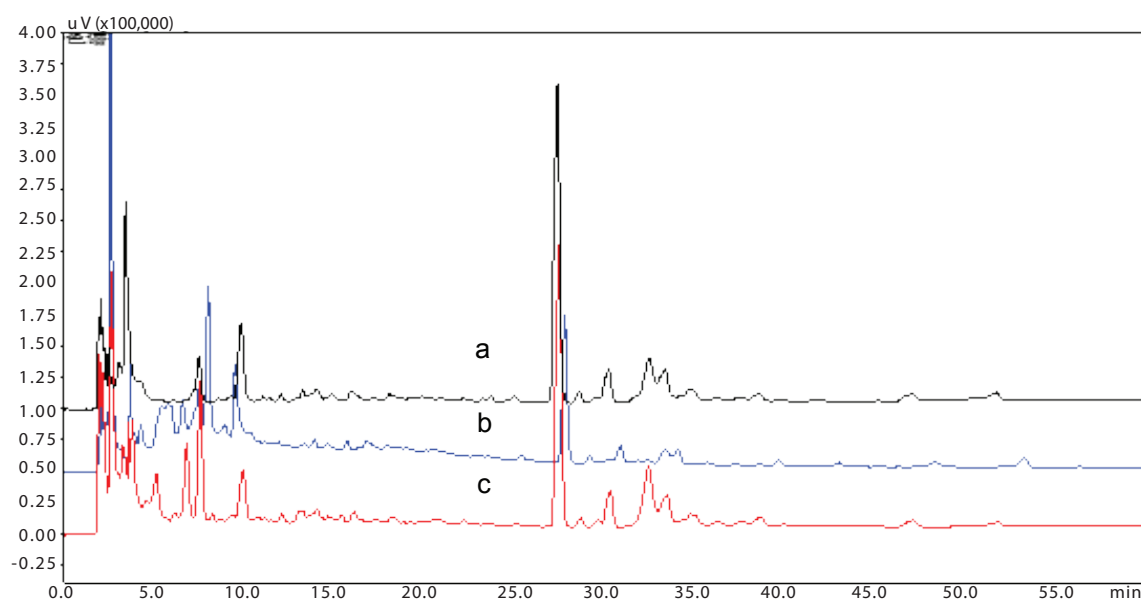


Figure 2: The comparison of chromatograms between *Schisandrae Chinese Fructus*, Sheng-mai-yin single decoction and Sheng-mai-yin co-decoction. (a) The separated decoction of *Schisandrae Chinese Fructus*, (b) The single decoction of Sheng-mai-yin, (c) The co-decoction of Sheng-mai-yin

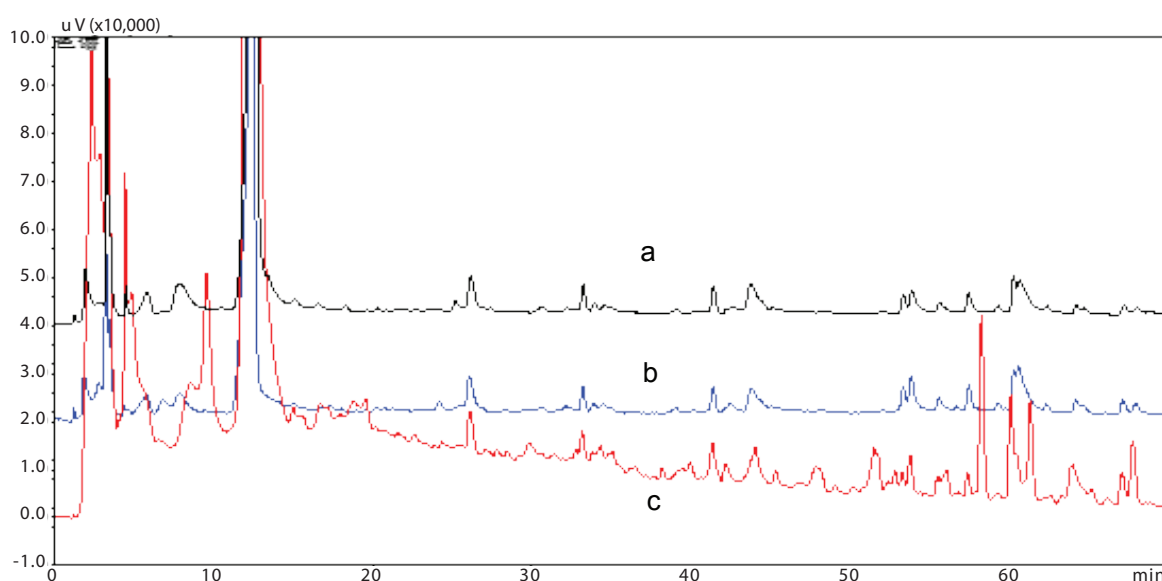


Figure 3: The compared of chromatograms between *Ophiopogonis Radix* in Sheng-mai-yin single decoction and Sheng-mai-yin co-decoction. (a) The separated decoction of *Ophiopogonis Radix*, (b) The single decoction of Sheng-mai-yin, (c) The co-decoction of Sheng-mai-yin

HPLC-ESI-MS results was listed in table 1, which showed that most of the high and medium-polar ginsenosides in Sheng-mai-yin co-decoction vanished away, such as Notoginsenoside Rg₁, Rb₁, R₁, Rb₂, Ra₁, Ra₂, Ra₃, Rc, Rd and Re. Meanwhile, the contents of low-polars ginsenosides increased, for example, Rh₄, Rs₃, Rg₆, Rg₅, Rg₃ and its isomers.

HPLC-UV, as well as HPLC-ESI-MS was used to develop the fingerprint of *Schisandrae Chinensis Fructus* in Sheng-mai-yin. The medium-polar compositions and low-polar parts in *Schisandrae Chinensis Fructus* almost had no change between single and co-decoction, except the generation of some new chromatographic peaks in high-polar components in Sheng-mai-yin co-decoction (Figure 2). In other words, the compositions in

Schisandrae Chinensis Fructus are impacted weakly by *Ginseng Radix et Rhizoma* and *Ophiopogonis Radix* in co-decoction. Secondly, the fingerprint of *Ophiopogonis Radix* in Sheng-mai-yin was established by HPLC-UV, too. The other two drugs also can hardly affect *Ophiopogonis Radix* in Sheng-mai-yinco-decoction (Figure 3).

Pharmacodynamics effects of Sheng-mai-yin single and co-decoction were studied, through the myocardial hypoxia and arrhythmia model of the mice. Single decoction has stronger anti-myocardial anoxia effect than co-decoction. Also, the high dose of Sheng-mai-yin co-decoction and the low dose of single decoction can significantly extend the start time of arrhythmias in mice induced by BaCl₂. They

No.	Ginsenoside	Gingseng single decoction		Sheng-mai-yin co-decoction	
		Rt./min	(M-H)	Rt./min	(M-H)
1	Ginsenoside Rf	12.82	961.7	disappear	
2	Notoginsenoside R ₁	14.32	931.7	disappear	
3	Ginsenoside Rg ₁	20.67	799.7	disappear	
4	Ginsenoside Re	21.54	945.8	disappear	
5	Ginsenoside Rf	39.84	799.7	39.83	799.6
6	Notoginsenoside R ₂	41.14	769.8	41.16	769.7
7	Ginsenoside Rb ₁	41.30	1107.9	disappear	
8	Ginsenoside Rc	42.42	1077.9	disappear	
9	Ginsenoside Ra ₁ /Ra ₂ /isomer	42.45	1209.7	disappear	
10	Ginsenoside Rb ₂ /Rb ₃	43.91	1077.9	disappear	
11	Ginsenoside Rb ₂ /Rb ₃	43.91	1077.9	disappear	
12	Ginsenoside Rd	47.38	945.8	disappear	
13	Ginsenoside Rg ₆ /F ₄	8.02	765.7	8.02	765.7
14	Ginsenoside Rg ₆ /F ₄	8.72	765.7	8.72	765.7
15	Ginsenoside Rh ₄	10.22	619.6	10.22	619.6
16	Ginsenoside Rg ₃ /isomer	11.68	783.8	11.66	783.8
17	Ginsenoside Rg ₃ /isomer	12.77	783.8	12.79	783.8
18	Ginsenoside Rs ₃ /isomer	15.07	825.0	15.07	825.0
19	Ginsenoside Rs ₃ /isomer	15.07	825.0	15.07	825.0
20	Ginsenoside Rg ₅ /Rk1	18.58	765.9	18.58	765.7
21	Ginsenoside Rg ₅ /Rk1	19.45	765.9	19.45	765.7

Table 1: The Comparison of the types of Ginsenoside between *Gingseng* Single Decoction and Sheng-Mai-Yin Co-Decoction by HPLC-ESI-MS

can significantly inhibit the incidence rate of ventricular fibrillation induced by chloroform in mice.

HPLC-UV and HPLC-ESI-MS based chemical profiling method was proposed and validated to rapidly evaluate the chemical constituents of Sheng-mai-yin single and co-decoction. Compared with single decoction, the most visible change is that the high and medium-polar ginsenosides in Sheng-mai-yin co-decoction vanished away, such as Notoginsenoside Rg₁, Rb₁, R₁, Rb₂, Ra₁, Ra₂, Ra₃, Rc, Rd and Re. Meanwhile, the chemical compositions of *Fructus Schisandrae* and *Radix Ophiopogoni* almost had no change.

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