SciForschen
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ISSN 2471-8122

Journal of Pharmaceutical Analytics and Insights

Letter to Editor | Volume: 1.2 | Open Access

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

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**Received date:** 01 Dec 2015; **Accepted date:** 25 Mar 2016; **Published date:** 29 Mar 2016.

**Citation:** Liu JL, Wang XD, Lv CN, Lu JC (2016) The Comparative Study of Quality Between Sheng-Mai-Yin Single and Co-Decoction. J Pharm Anal Insights 1(2): doi http://dx.doi.org/10.16966/2471-8122.106



Decocting 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

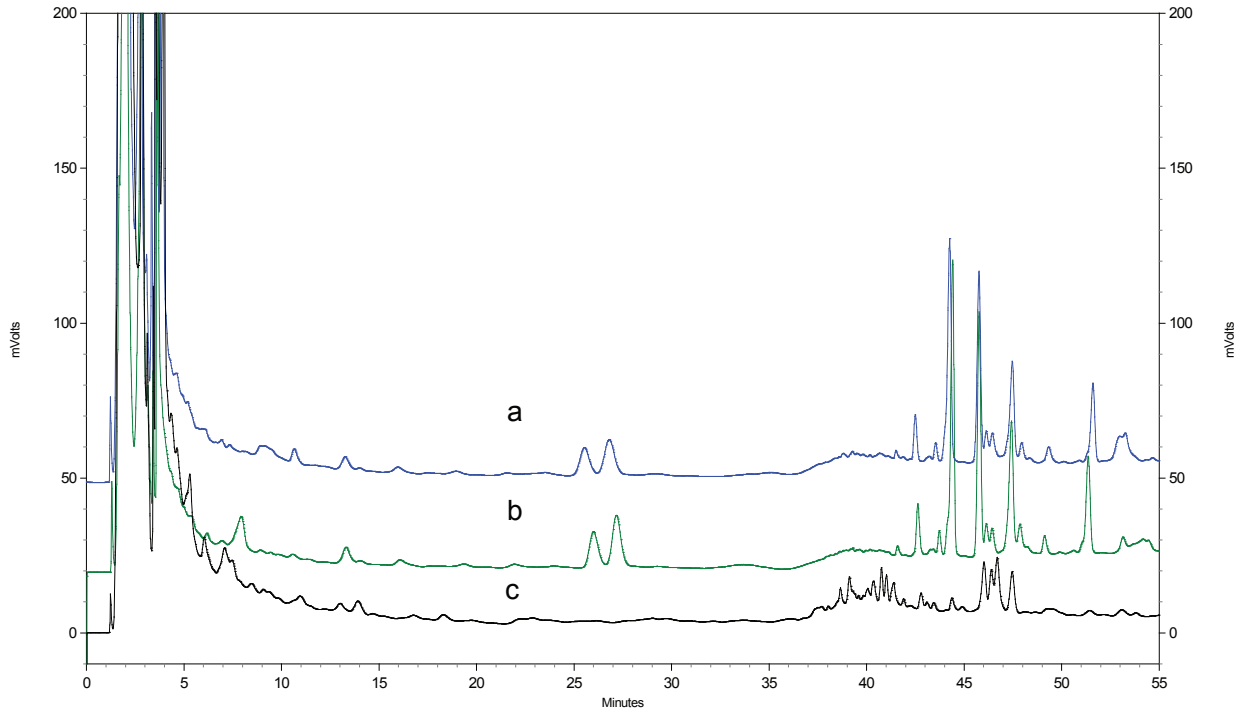


**Figure 1:** The comparison of chromatograms between *Ginseng Radix et Rhizoma*, Sheng-mai-yin single and Sheng-mai-yin co-decoction with gradient elution program. (a) The separated decotion of *Ginseng Radix et Rhizoma,* (b) The single decotion of Sheng-mai-yin, (c) The co-decotion of Sheng-mai-yin

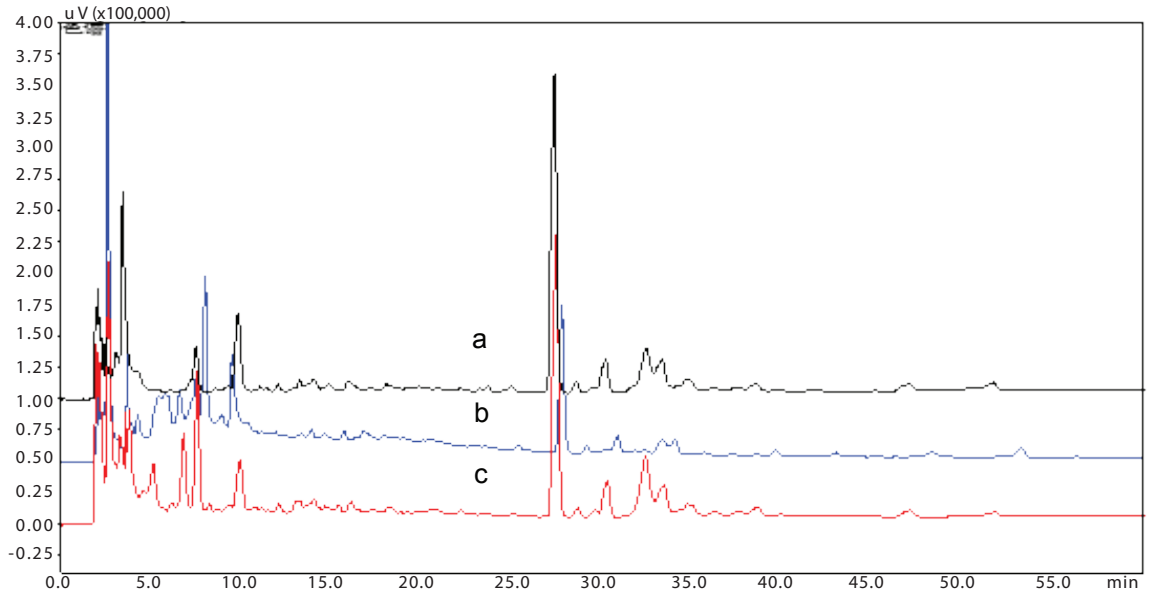


**Figure 2**: The comparision of chromatograms between *Schisandrae Chinese Fructus*, Sheng-mai-yin single decoction and Shengmaiyin co-decoction. (a) The separated decotion of *Schisandrae Chinese Fructus*, (b) The single decotion of Sheng-mai-yin, (c) The co-decotion of Sheng-mai-yin

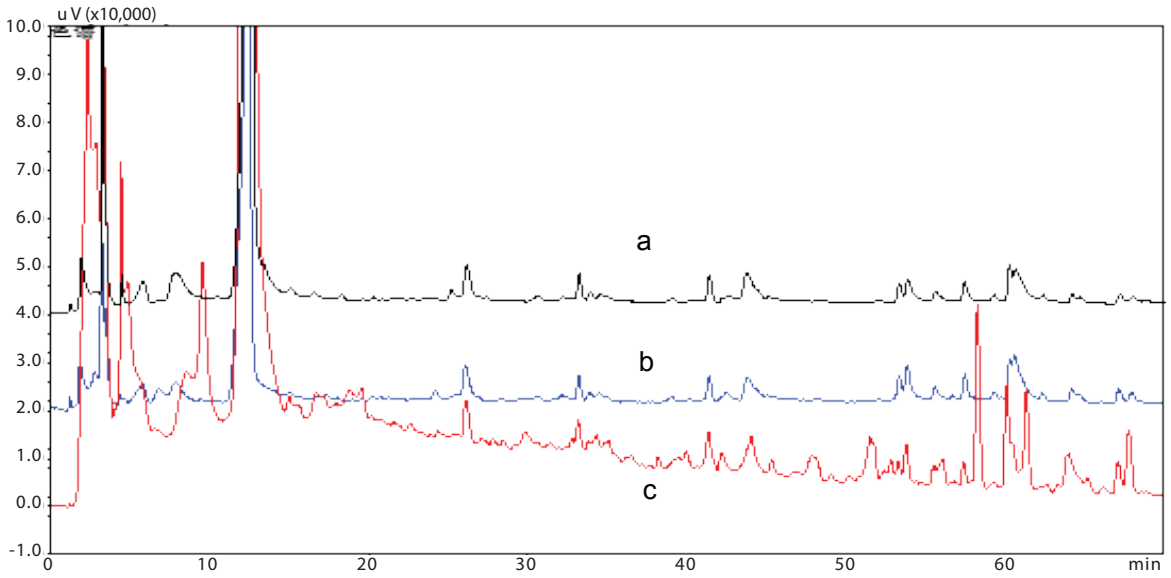


**Figure 3:** The compared of chromatograms between *Ophiopogonis Radix* in Sheng-mai-yin single decoction and Sheng-mai-yin co-decoction. (a) The separated decotion of *Ophiopogonis Radix*, (b) The single decotion of Sheng-mai-yin, (c) The co-decotion of Sheng-mai-yin

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 $Rg_1$, $Rb_1$, $R_1$, $Rb_2$, $Ra_1$, $Ra_2$, $Ra_3$, Rc, Rd and Re. Meanwhile, the contents of low-polars ginsenosides increased, for example, $Rh_4$, $Rs_3$, $Rg_6$, $Rg_5$, $Rg_3$ 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 $BaCl_2$. 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 |

**Table1:** 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 $Rg_1$, $Rb_1$, $R_1$, $Rb_2$, $Ra_1$, $Ra_2$, $Ra_3$, Rc, Rd and Re. Meanwhile, the chemical compositions of *Fructus Schisandrae* and *Radix Ophiopogoni* almost had no change.

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