

Abstract

Kushen, one of the traditional Chinese medicines, is the dried root of *Sophora flavescens* Ait. Recent studies have demonstrated the multiple pharmacological actions of Kushen such as anti-tumour, anti-inflammation, anti-bacterial and anti-viral activities. In this thesis, four flavonoids were isolated from Kushen. And HPLC methods were developed for quantification of alkaloids and flavonoids in Kushen, respectively. Near-infrared diffuse reflectance spectrometry (NIRDRS) was also first developed for identification and quantification of Kushen. Based on the studies above, quality control of Kushen was improved.

The thesis is consist of four chapters.

Chapter 1 is a review of recent researches on Kushen, including chemical components, quality control, bioactivities and clinical uses.

Chapter 2 is for the preparation and identification of chemical compounds from Kushen. Four flavonoids (trifolirhizin, kurarinone, kushenol C and kushenol P) were isolated by chromatography and characterized by UV, MS, $^1\text{H-NMR}$ and $^{13}\text{C-NMR}$. The purity of the four compounds is more than 98%, which is suitable for quality control of Kushen.

In chapter 3, HPLC methods were developed to quantitate the contents of alkaloids and flavonoids in Kushen, respectively. In brief, the contents of five active alkaloids such as matrine, oxymatrine, sophocarpine, oxysophocarpine and sophoridine in Kushen were determined by using HPLC. A carbohydrate column (250mm×4.6mm · 5 μm) was used and eluted with acetonitrile-ethanol-water(pH2) (79:11:10). The detection was at 220 nm. Then, RP-HPLC method was first developed for simultaneous determination of three flavonoids (kurarinone, kushenol C and kushenol P) in Kushen. Both methods are simple, accurate and repeatable. Using the methods, contents of the investigated compounds in Kushen from different places were determined.

On the other hand, NIRDRS was first developed for identifying Kushen. A

model was established based on the contents of oxymatrine and total alkaloids in Kushen from different sources and their NIRDRS spectra. Using this model, quality of Kushen could be controlled. The predicted values of oxymatrine and total alkaloids in Kushen by extra validation were well in accordance with the true values. This is a new, rapid, simple and inexpensive method for controlling the quality of Kushen.

Chapter 4 is the study of the anti-tumour activities of Flavonoids in Kushen.

In-vitro anti-tumour activities of the four isolated compounds from Kushen, Trifolirhizin, Kurarinone, Kushenol C and Kushenol P, were screened by using HL-60, BGC-823 and MDA-MB-435 tumour cell lines. The results showed that Kurarinone inhibited the HL-60 and MDA-MB-435 cells at least 50%, while Trifolirhizin, Kushenol C and Kushenol P did not show any significant inhibition.

Chapter 5 is the conclusions of this study.

Keywords *Sophora flavescens Ait* Alkaloid Flavonoid Quality control