Modern Research and Application Analysis of Flos Puerariae

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Abstract. Objective: To analyze the modern research and application of Flos Puerariae, and lay a foundation for the comprehensive utilization of Flos Puerariae in the future. Methods: The relevant literatures on Flos Puerariae were screened out on the knowledge network for nearly 20 years. Through analysis and summary, the pharmacological effects, chemical components and attending diseases of Flos Puerariae were summarized. Results: The main constituents of Pueraria lobata were flavonoids, alkaloids and saponins of Flos Puerariae, which had pharmacological effects such as hangover, liver and inflammation, and elimination of free radicals. The search for "Flos Puerariae" on the Internet was conducted from 1998.1 to 2018.10. There are 661 related literatures, including 499 journal articles, and 378 of them are finally selected. Through statistical induction, GeFlos Puerariae is clinically used for diseases such as drunkenness, alcoholism, alcoholic liver disease, etc., and has good curative effect; Conclusion: The existing pharmacological effects of Flos Puerariae can better serve the clinic. The compatibility of Flos Puerariae and other traditional Chinese medicines enhances the therapeutic effect, provides theoretical guidance for some complex diseases, and provides experimental basis for clinical application.

1. Introduction
Since 1998, the attention of Flos Puerariae has gradually increased, and the chemistry and pharmacology of Flos Puerariae have been reported in many literatures. Through the analysis and summary of the chemical constituents, pharmacological effects and adaptive diseases of Flos Puerariae in the past 20 years, this paper explores the clinical application characteristics of Flos Puerariae, and lays a foundation for the comprehensive utilization of Flos Puerariae in the future.
In the CNKI, enter "Flos Puerariae", sorted by time. From 1998 to now, there are 661 articles in total, including 499 journal articles. Through literature classification, the literature is divided into active ingredients, extraction process, and pharmacological effects. There are 5 categories in clinical application, literature review, and topic-independent categories.

Table 1. Search Literature Classification and Number of Articles, Proportion Details.

| Classification | Active ingredients and extraction process | Pharmacological action | Clinical application | Literature review | Nothing to do with the topic |
|----------------|------------------------------------------|------------------------|----------------------|------------------|-----------------------------|
| Number of articles | 74                                       | 123                    | 181                  | 44               | 77                          |
| Proportion (%)    | 14.83                                    | 24.65                  | 36.27                | 8.82             | 15.43                       |

Among the retrieved literatures, there are 44 reviews: research progress of Flos Puerariae, treatment of liver disease; 77 articles unrelated to the topic, including: articles on market development and sales, production and processing of puerarin, and most of them before 2006 literature. In this review, the screening articles are rounded down to review categories and topics that are not related to the topic.

2. Flos Puerariae Active Ingredient and Extraction Process
There are 74 papers on the main active ingredients and extraction techniques of Flos Puerariae
lobata, accounting for 19.58% after screening. Through the analysis of the literature, since the beginning of 2009, the determination and extraction process of Flos Puerariae components has received much attention.

2.1 The Active Ingredient of Flos Puerariae

The effective active ingredients of Flos Puerariae are: total flavonoids of Flos Pueraria lobata, such as glucoside, phytoside, and saponin; total saponins of Flos Pueraria, such as Pueraria saponin, soybean saponins; volatile oils such as acetate; polysaccharides; etc. The extraction process and content determination of the active constituents of Flos Pueraria lobata provide better quality standards for the application of Flos Puerariae [1-3].

At present, the main component of total flavonoids of Flos Pueraria is known as Flos Pueraria isoflavones. Modern research uses RRLC-Q-TOFMS/MS method, HPLC[4-6] and other techniques for the analysis and separation of isoflavones in Flos Puerariae, the components of Flos Puerariae, glycosides of Flos Puerariae, daidzin, genistein and other components were obtained.

2.2 The Extraction Process of Flos Puerariae

The extraction process of Flos Puerariae is more concerned. The commonly used [7-9] is: enzymatic assisted ultrasonic method (enzymatic hydrolysis time is 5h, enzymatic hydrolysis temperature is 55°C, enzyme concentration is 1.2%, and the ratio of material to liquid is 1:30), this is a preferred extraction process condition. Design Expert software and Box-Behnken design method design response surface test method, orthogonal test method, star point design-effect surface method optimization method, ultrasonic assisted extraction method, etc. The content standard of Flos Puerariae is gradually improved, and the extraction process is gradually optimized. It provides better guidance for the dosage of Flos Puerariae and the production process of new medicine.

3. Pharmacological Action

There were 123 literatures on pharmacological effects, accounting for 32.54% of the total literature after screening. The literature results show that the pharmacological effects of Flos Puerariae hangover and liver protection are the most significant, which is inseparable from its anti-inflammatory, anti-oxidation and elimination of free radicals.

3.1 Hangover, Liver Protection

In animal experiments [10], Flos Puerariae can reduce the blood alcohol concentration of drunken model mice, increase the activity of ADH in mice liver, inhibit the occurrence of inflammation, and thus prevent alcoholism. In cell experiment [11], the survival rate of ethanol-induced L-02 cells was detected by MTT assay, which indicated that the extract of Pueraria lobata could reduce the inflammatory response of L-02 hepatocytes and reduce oxidative stress and play a role in the treatment of alcoholic liver injury. The serum levels of inflammatory factors in the rat model of inner ear injury induced by isoproterenol decreased, indicating that Flos Puerariae has a good pharmacological effect on hangover and liver protection.

3.2 Protect Brain Tissue and Cardiomyocytes

The brain striatum neurotransmitter content, brain tissue enzyme activity and hippocampal AchE content were detected by establishing a mouse drunkenness model [12]. The results showed that the Pueraria lobata extract can reduce the striatum DA, 5- of the drunken model mice. The content of AchE in HT and hippocampus reduced MDA and increased SOD content in brain tissue, suggesting that the active constituents of Flos Puerariae have protective pharmacological effects on brain tissue; In a mouse model of diabetic cardiomyopathy, Flos Puerariae has attenuated oxidative stress to prevent cardiomyocyte apoptosis, and thus has a therapeutic effect on STZ-induced diabetic cardiomyopathy. Flos Puerariae has protective effects on myocardial cells in animal models of myocardial ischemia-reperfusion injury, mouse model of acute myocardial infarction, and mouse model of adriamycin-induced myocarditis.
3.3 Anti-Tumor

In Li Jun's research[13], Flos Puerariae Jieyu Recipe inhibited the growth of H22 hepatoma cells in BALB/c mice, which inhibited the growth of tumor blocks in mice and regulated tumor suppressor genes. Fangzhong Flos Puerariae plays a major role. In the study of the effect of early appendix isoflavones on human hepatoma cell line SMMC-7721, the active constituents of Pueraria lobata have a significant inhibitory effect on the proliferation of hepatoma cells, and are reflected in the cell state and cell number. The animal experiments confirmed the effectiveness of Flos Puerariae at the level of molecular research, and the experiments at the molecular level further explained the anti-tumor mechanism in animal models.

The pharmacological effects of Flos Puerariae have bacteriostatic, hypolipidemic and antihypertensive effects, and the positive effects of these effects on different animal models are ultimately associated with the protection of liver, and the synergistic treatment between pharmacological effects. The function system embodies the characteristics of Flos Puerariae as a Chinese herbal medicine with many active ingredients and multiple targets.

4. Clinical Application

In the 181 published literatures, it was found that Flos Puerariae was used in the treatment of drunkenness, alcoholism, alcoholic liver disease and sequelae in the early stage. In recent years, the literature on the treatment of cerebral ischemia, myocardial ischemia, liver cancer, etc. increase.

4.1 Drunk, Alcoholism

As early as in the "spleen and stomach theory" mentioned "Flos Puerariae Jiejiu Tang" treatment of drinking too much, all kinds of drugs into the end of oral administration, for the treatment of dizziness, fever, urination after drunk adverse effects have a good effect. Flos Puerariae can inhibit the absorption of ethanol in the digestive tract mucosa, thereby reducing the amount of ethanol in the blood.

4.2 Alcoholic Liver Disease

Alcoholic liver disease is the result of long-term heavy drinking resulting in pathological damage to the liver, including alcoholic fatty liver, alcoholic hepatitis, and cirrhosis. Alcoholic liver disease has a complicated pathogenesis, immune function damage of the organism, and imbalance of liver enzyme activity, which is extremely harmful to humans and has a low cure rate. At present, studies have shown that in the clinical treatment of alcoholic liver disease, Flos Puerariae Jiejiu Tang[14] which therapeutic effect is better than Western medicine treatment, indicating that Flos Puerariae has a good therapeutic prospect in clinical practice.

4.3 Others

There is a large amount of literature research: It has been clarified that Flos Puerariae has anti-tumor, protects cardiomyocytes, and improves blood circulation of brain tissue. However, there are few clinical studies on treating liver cancer, cerebral ischemia and myocardial ischemia. Flos Puerariae is used for these complex diseases, developing more effective new drugs, and alleviating pain for patients.

5. Discussion

Since ancient times, Flos Puerariae has been widely used. With the development of Flos Puerariae products, its safety hazards and dosages have become the focus of attention. In the subchronic toxicity[15], acute toxicity and genotoxicity[16] research experiments, Flos Puerariae had no adverse effects and side effects on the animal model, indicating that Flos Puerariae was basically non-toxic. Nevertheless, in order to ensure safe drug dosage, it is necessary to understand the patient's constitution, control the clinical dose of the Flos Puerariae, and determine and ensure the safe dose range of the flower in the health care product.
Through the search of the literature, it was found that the application of the Flos Puerariae group prescription in clinical application was significantly more than that of the single-flavor medication, and the representative medicine had the compound Flos Puerariae Jiecheng Tang; Chinese patent medicines include Fufang Jiejiu Granules, Jiejiu Hugan Granules, etc. However, in the 2015 edition of the Chinese Pharmacopoeia, there is no record of Chinese patent medicine containing Flos Puerariae. Under the premise of meeting the standards of the State Food and Drug Administration and ensuring the efficacy and stable content of proprietary Chinese medicines, the development and utilization of Chinese patent medicines containing Flos Puerariae will meet the needs of the majority of patients and will bring better economic and social benefits.

In summary, Flos Puerariae is a traditional Chinese medicine with many active ingredients, clear pharmacological effects and wide therapeutic range. Its application in clinical and health care products provides guidance for Flos Puerariae in the treatment of diseases and new drug development. Flos Puerariae is rich in resources and has broad prospects. It will connect Flos Puerariae to the society, not only serve the clinic, but also have a good development prospect for its comprehensive utilization.

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