



A Survey of the Medicinal Use and Pharmacological Effects of Gongju

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Abstract

Huizhou Gongju (Huizhou chrysanthemum), a traditional Chinese herb growing in the ancient Huizhou area, is one of the genuine medicinal materials used and promoted by Xin'an Medicine School. As a representative flower-derived herbal medicine, Gongju is widely used for the prevention and treatment of a variety of diseases due to their pharmacological activities in China. This paper briefly describes the origin and history of Gongju's medicinal use, and introduces its morphological characteristics, planting conditions and harvesting. This paper also provides an overview of the effective chemical ingredients and pharmacological value of Gongju. According to the analysis, Gongju has remarkable applications in Traditional Chinese Medicine (TCM) for the treatment of clearing liver and inner heat, brightening eyes, treating hypertension and hyperlipidemia, anti-microbial, anti-inflammatory, anti-aging, etc. This paper also summarizes the medication methods and clinical application methods of Gongju, which can serve as the foundation and basis for both domestic and foreign scholars to do further research about this well-known traditional Chinese herb.

Keywords: Gongju; TCM; Xin'an Medicine School; medicinal use; pharmacological effects

Introduction

Chrysanthemum originates in ancient China and has a long history of cultivation; it was first cultivated in China as a kind of herb in approximately the 15th century B.C. and was then successively introduced to Japan, Europe, and the United States. After being introduced to foreign countries, it was named *Chrysanthemum morifolium* (Romat.) by scholars in 1792. And the scientific term has been adopted by *Pharmacopoeia of the People's Republic of China* 《中华人民共和国药典》 since then. Gongju (贡菊), also known as Huizhou Chrysanthemum, is one of the most precious species of *Chrysanthemum morifolium* (Romat.) growing in ancient Huizhou area, which has both ornamental value and medicinal functions. The flower head of Chrysanthemum has already become a paradigm of flowers serving as traditional Chinese herbal medicines for thousands of years. As a representative variety of Chrysanthemum, Gongju has significant medical and health care functions, and shows significant pharmacological value of treating the respiratory and cardiovascular diseases, and antimicrobial, anti-inflammatory, anticancer, neuroprotective, etc.

Cradle of Gongju---Xin'an Medicine School

Gongju is mainly planted in mountainous areas of She County, Anhui province. Under the inheritance and development of Xin'an Medicine School (新安医学药派), a traditional school of TCM, this valuable herb has come into play and formed a sort of genuine medicinal material relying on the geographical advantage of Mount Huang in Anhui province.

Formed in the Song and Yuan Dynasties and flourished in the Ming and Qing Dynasties, Xin'an Medicine School refers to a reputable TCM school developing from ancient Xin'an region, which has the accumulation of profound traditional culture and history. Externally, the unique environment provides the necessary growth conditions for the development of Xin'an medicine. Ancient Xin'an County has convenient water and land transportation, suitable climate and temperature, and rich types of medicinal plants, which provide obvious external environment advantages for Xin'an medicine. Internally, Xin'an Medicine School involves admirable

qualities of doctors like “keeping integrity and innovation” and “being open and inclusive and enjoying fame overseas”, etc. With unique clinical diagnosis and treatment skills, remarkable contributions have been achieved in internal medicine, surgery, gynecology, and pediatrics by Xin’an Medicine School. Besides, Xin’an medicine covers a wide range of fields, such as clinical applications, theoretical researches, academic discussions, and cultural resources [1], which lays the solid foundation for its high development value and becoming one of the representative schools of TCM.

Under the influence of Huizhou culture, the school is famous for its time-honored history, numerous talented doctors, rich medical works and being skilled at using herbs. As early as the Ming and Qing Dynasties, Xin’an Medicine School was widely spread overseas, especially in Korea and Japan. In the *Chinese Medical Register*《中国医籍考》compiled by Motofu Tamba (丹波元胤), a well-known Japanese medical scientist committed to studying TCM, 63 Xin’an doctors and 139 Xin’an medical books were registered [2], which has a significant impact on the development of medicine profession abroad.

Gongju---a Representative Herb of Xin’an Medicine

Chinese herbal medicine is the precious legacy of the Chinese people’s struggle against diseases for thousands of years and the essence of Chinese culture accumulated over thousands of years. Today, TCM has already formed a systematic discipline and has promoted the development of medicine and pharmacy in China and even the world. Chinese herb is both the material basis of disease prevention and treatment and an important part of TCM.

With abundant rainfall, temperate climate and unique ecological environment, Xin’an mountainous area is rich in Chinese herbal resources, which are valuable heritage of Chinese medicine and botany. It is recorded in *Research on Xin’an Medicine School*《新安医学流派研究》that there are about 400 species of herbs growing in Xin’an region. Among them there are more than 60 rare species, and thereinto Chrysanthemum (Gongju, 贡菊), Atractylodes (Baishu, 白术), and Cornus (Shanzhuyu, 山茱萸) serve as the main herbs [3]. Typically, Gongju has a long history of medicinal use, significant medical and health care functions, and serves as one of the paradigms of flowers for Chinese dietary herbal medicine use.

Research on the History of Gongju’s Medicinal Use

Chrysanthemum morifolium (Romat.) is a perennial herb belonging to chrysanthemum in the asteraceae family. The earliest research on its pharmacological value can be traced back to the book *Shen-nong’s Herbal Classics*《神农本草经》written in the Eastern Han Dynasty. It said: “Chrysanthemum can be used to help treat wind-cold type of cold, dizziness, swelling, tearing, numbness of the skin, and fixed impediment. Long-term use of chrysanthemum is beneficial to qi and blood and has the effect of prolonging life”[4]. Furthermore, many authoritative historical materials have recorded Gongju’s thousands of years of history for

medicinal use by now.

According to Chinese Professor Wang Dequn’s study on the historical origin of Chrysanthemum morifolium (Romat.) for medical use in China, Gongju was originally introduced as an ornamental flower by Huizhou merchants from Deqing County, Zhejiang Province during the Song Dynasty [5]. *The Annals of Huizhou Prefecture*《徽州府志》in 1566 issued a total of 83 species of Chinese herbs [6], among which chrysanthemum is listed, and thereinto is described as: “There are varieties of chrysanthemum. A men from She County 歙县in Song Dynasty has painted 81 kinds of diagrams of chrysanthemum”. Chrysanthemum was then widely planted and became a precious tribute sacrificed for emperors of ancient China.

According to the *Medical Records of Anhui Province*《安徽省医药志》, there was a year of great drought, many people in She County suffered from pinkeye and headache. The diseases had troubled the local people for a long time until someone soaked chrysanthemum in water for drinks. To everyone’s surprise, the method is so effective in reliving dizziness. From then on, farmers living in She County began to plant chrysanthemum massively in front of and behind their houses, and dried the fresh flowers for long-term storage. However, during the reign of Emperor Guangxu of the Qing Dynasty, people in the Forbidden City in Beijing also troubled by pinkeye. The emperor then issued a decree to look for famous doctors and effective medicines. The local governor of Huizhou then sacrificed chrysanthemums from Shexian County to the emperor and successfully cured the eye disease. Thus, the chrysanthemum became famous in the state and got its name of Gongju, which means chrysanthemum for tributes use in ancient China”[7].

With the inheritance and development of Huizhou people, Gongju becomes a genuine medicinal herb of Chinese medicine. Gongju has also been listed as one of the valuable medicinal herbs for foreign trades on account of its annual export volume of more than 50 tons, which makes it one of the important mediums for Chinese medicine to go abroad.

Morphology and Characteristics of Gongju

Gongju belongs to white chrysanthemum with yellowish heart and tongue-shaped flowers. The chrysanthemum flowers are large, uniform and not scattered, with white petals and green tips. The shape of Gongju flowers are mostly oblate or irregularly spherical, 80cm to 120cm in height, and 1.5cm to 2.5cm in diameter. The flower always smells fresh and fragrant and feels soft and tender. While picking flowers, farmers are accustomed to placing them in a special bamboo frame in order to ensure their shape is complete. After drying, the upper part of the petals are folded, and the edges are slightly rolled inside and wrinkled. Usually, the flowers have no glandular spots. Gongju can be used for making tea which is effective on the treatment of respiratory and cardiovascular diseases, while the making procedure is quite simple. After brewing for several times, the petals gradually turn pale brown, reflecting

the tender quality of the original tea which is not resistant to high temperature.

Planting and Harvesting of Gongju

The planting and growth of herbs are closely related to the environmental conditions. The geographical and climatic conditions of China provide a good growing condition for the cultivation of genuine medicinal materials [8]. The nation China is blessed with complex climatic conditions, unique geographical location, fertile soil and rich biodiversity. The nation also has the third largest land area in the world, spanning cold temperate, temperate, subtropical and tropical zones, which provides good external conditions for the cultivation of genuine herbs in its national medicine system.

Gongju is mostly cultivated in the mountainous areas at an altitude of 300-600 meters. Mount Huang, the birthplace of Gongju, is located in the area with clear water and green mountains, distinct four seasons, warm climate, abundant rainfall, sufficient sunshine, and an average annual temperature of 16.4°C, which is quite suitable for the cultivation of Gongju. As a representative flower-derived therapeutic dietary herb, Gongju grows in pollution-free mountainous area, which makes the flower head possess excellent ornamental and edible value. The best planting time of Gongju is generally from early April to early May each year. The garden land where Gongju is planted should be slightly acidic sandy loam soil with gentle topography, small slope, good permeability, good drainage and irrigation performance. The soil should be fertile and loose too. In addition, Gongju is a short-day plant and prefers a daily light time of 7 to 9 hours. As the plant is about 80 cm high and the flower stems are thin, it is necessary to avoid planting Gongju in windy areas.

Gongju blooms in autumn, and the harvesting of Gongju generally falls on early October. In order to ensure adequate nutrition and to improve its quality, removing excessive buds around October 1 is a necessary step. From the end of October to the beginning of November, when the flower cores are spread out by 60% to 70%, it is about time farmers harvested the flowers. The picked flowers, especially those picked in rainy days, should be spread on the bamboo flat in time and then baked and dried for long-term storage.

Effective Chemical Components of Gongju

Medicinal plants are rich in certain substances and beneficial elements required by human body, all of which are one of the important material bases for disease prevention and treatment in clinical practice. According to different origin places and processing methods, medicinal chrysanthemum can be classified into several varieties like Huizhou chrysanthemum (Gongju, 贡菊), Hangzhou chrysanthemum (Hangju, 杭菊), Bozhou chrysanthemum (Boju, 亳菊), Chuzhou chrysanthemum (Chuju, 滁菊). Experimental studies by many scholars have proved that chrysanthemum contains a large number of effective chemical components and trace elements that are beneficial to human body. It is worth noting that some

components in Gongju is more effective and prominent than other varieties.

A. Volatile oil and flavonoids

The volatile oil and flavonoids are the main active constituents existed in Gongju, and the content of volatile oil is about 0.11%-0.21%, which is higher than that of other medicinal chrysanthemum varieties [9]. The volatile oil contains active substances such as Chrysanthenone, Adnine, Choline, Stachydrine, Borneol, Aminozone, Camphor and Vitamins. The flavonoids existed in Gongju contains active substances like Apigenin, Quercetin, Baicalein, Luteolin, etc., which have significant pharmacological effects on protecting immune system and preventing and treating cardiovascular disease, cancer, and others.

B. Mineral elements

Gongju also contains mineral elements which are highly essential for human body. It is known that mineral elements play an important role in regulating cell metabolism, maintaining the relative pH of blood and tissues, and strengthening bone strength. The experiments of Yang Bingyi's team have proved that chrysanthemum is rich in mineral elements, including two macro elements of calcium and magnesium and trace elements such as manganese, iron and zinc [10]. Regular consumption of Gongju is of great benefit to human health and can be used to supplement the essential trace elements of the human body, so as to prevent and treat diseases.

Consumption of Gongju

As a representative flower-derived herbal medicine, Gongju can be used as both medicinal herbs and drinking tea. For one, Gongju is mainly used for the treatment of respiratory and cardiovascular diseases, and also shows significant effects on antimicrobial, anti-inflammatory, anticancer, and neuroprotective activities. For another, it is mentioned that Gongju has a long history for its tea use. Gongju tea is commonly used as a treatment for hypertension and is said to help treat fevers, headaches, and inflammation. People in China usually take 5-6 dried flowers, brew them with boiling water above 90 degrees, and then simmer for about 10 minutes. The tea tastes bitter, and the diabetes-free people usually add sugar to enhance its taste. In addition, Gongju tea is often mixed with other herbs, such as wolfberry (Gouqi, 枸杞). Gongju and wolfberry tea is a classic Chinese medicinal group tea. With refreshing flavour, it can also be used to brighten eyes and dispel internal heat. Although Gongju tea has a very good health effect, it should not be taken indiscriminately due to its cool nature, and patients with weak constitution must take it sparingly.

Pharmacological Effects of Gongju

Gongju is widely used in the clinical Chinese medicine and has significant medicinal efficacy and clinical therapeutic effects as following.

A. Effects on clearing heat, detoxifying, nourishing liver and brightening eyes

Available evidences show that the effects of Gongju on “clearing heat and detoxifying, nourishing liver and brightening eyes” were recorded in one of the TCM classics called *Collected Works of Materia Medica* 《本草汇言》 compiled in the Ming Dynasty [11]. These pharmacological effects of Gongju have been inherited for more than 600 years so far. Modern pharmacology has also proved that Gongju is rich in vitamin A, which has the effect of calming and clearing heat. It is also effective in treating dry eyes caused by overuse, nourishing liver, brightening eyes, and treating wind-heat colds, headaches, and dizziness.

B. Effects on treating cardiovascular and cerebrovascular diseases

Flavonoid is one of the main components of Gongju. It is used to help treat some cardiovascular and cerebrovascular diseases and has the effect of regulating blood fat and lowering cholesterol. Pan Zhengjun and some scholars once made aqueous decoction of Gongju and tested its effect on the blood pressure and lipid content of experimental mice with hypertension diseases [12]. By doing clinical control experiments, it is proven that Gongju aqueous decoction has the effect of lowering blood pressure and regulating lipid content, which further confirms that Gongju tea is an effective healthy drink for hypertensive patients and can be used to treat hypertension and atherosclerosis.

C. Antibacterial and anti-inflammatory

The current studies have concluded that volatile oil extracted from Gongju has antimicrobial and anti-inflammatory properties. Borneol and camphor existed in the oil are the main active components for the functions. Borneol and camphor are effective in antibacterial and also have inhibitory effects on skin fungi, human tuberculosis bacillus and cold virus in vitro [13]. It can also enhance capillary resistance and inhibit capillary permeability, all of which are conducive to its anti-inflammatory properties.

D. Anti-pathogens

Previous pharmacological studies have shown that Gongju has anti-pathogenic effects. For instance, Gongju has obvious inhibitory effects on certain Gram-positive bacteria and Mycobacterium tuberculosis. Some foreign studies have also proved that chrysanthemum has an ability to inhibit and even kill herpes simplex virus and measles virus. In addition, another important property of chrysanthemum is the anti-AIDS effect [14]. Studies indicate that chrysanthemum can inhibit some transcriptase and HIV replication activities and has relatively low toxic effects on humans, which are conducive to anti-AIDS researches.

E. Anti-oxidation and anti-aging

Shen-nong's Herbal Classics 《神农本草经》 lists chrysanthemum as precious herbs, and praises its efficacy of anti-aging and prolonging life. Modern pharmacology believes flavonoid

compounds in Gongju have the antioxidant matters which can delay the atrophy of immune organs in aging organism.

F. Anti-tumor

The volatile oil of Gongju contains β -elemicene, which has a wide range of pharmacological effects such as broad-spectrum anti-tumor [15]. As one of the Chinese National Class I New Drug, β -elemene emulsion has been used in the clinical treatment of cancer patients.

G. Effects on protecting central nervous system

Apigenin in Gongju has sedative and calming effects, neuron protective effects, antidepressant effects, and cognitive protective effects [16].

Clinical Application

Based on its different pharmacological properties, Gongju can be used in different clinical fields as follows.

- The pharmacological effect of dispelling wind-heat has good therapeutic effect on the treatment of clinical illness such as fever, chills, dizziness, headache and dryness of the mouth and tongue caused by wind-heat colds.
- The pharmacological effect of clearing liver and brightening eyesight has good therapeutic effect on the treatment of clinical diseases such as migraine, hypertension, high blood pressure and sore throat, etc.
- The pharmacological effect of enhancing capillary resistance and inhibiting capillary permeability has good therapeutic effect on lowering blood pressure and regulating lipid content. Its application can be considered when the symptoms of cardiovascular and cerebrovascular diseases appear.
- The pharmacological effect of detoxifying and clearing heat has good therapeutic effect on the treatment of oral ulcer, swelling and pain, irritability and other clinical symptoms caused by excessive inner heat.
- The combination of Gongju and cassia seeds (Juemingzi, 决明子) and other herbs can help alleviate the symptoms of swollen and painful eyes and excessive tears caused by wind-heat syndrome.

Conclusion

As a natural product for both medicine and food, Gongju has developed into a genuine medicinal material under the inheritance of Xin'an Medicine School and has become a popular Chinese herbal medicine with a wide variety of medicinal uses. The paper describes Gongju's remarkable applications in TCM for the treatment of clearing liver and inner heat, brightening eyes, treating hypertension and hyperlipidemia, anti-bacterial, anti-inflammatory, anti-aging, etc. This paper also summarizes the medication methods and clinical application methods of Gongju. By reviewing the progress of the research on the effects of Gongju, this

paper hopes to provide reference for the in-depth investigation and utilization of this traditional Chinese herb.

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