Proceedings of the 4th International Conference on Biological Engineering and Medical Science
DOI: 10.54254/2753-8818/49/20241310

# The common component of traditional Chinese medicine formulations has a role in the treatment of hypertension

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**Abstract.** Hypertension is one of the most common cardiovascular diseases, but the control rate of hypertension is not high, only 16.8%, which a serious public health problem in our country. This article analyzes some commonly used traditional Chinese medicine formulations that effectively treat high blood pressure and lists the ingredients of these common drugs. Find common ingredients that includes: Rhizoma Gastrodiae, Uncaria, and Licorice. The study found that the active ingredients in the three herbs, such as gastrodin, gastrodia elata ethyl acetate extract routine and isoglycyrrhizin, have a significant effect on lowering blood pressure. This research can provide hypertensive patients with a better understanding of the reasons for taking these herbs and offer guidance on medication. It can also help patients recognize the necessity of combined Chinese medicine. However, the study only explore the blood pressure-lowering effects of the active ingredients but does not investigate the specific treatment of different types of hypertension using individual Chinese medicine preparations. In the future will refine the effects of these herbs in various types of hypertension.

**Keywords:** Hypertension,gastrodin, hypertension,gastrodin, gastrodia elata ethyl acetate extract, rhynchophylline, isoliquiritigenin.

## 1. Introduction

As living standards improve and the pace of life accelerates, an increasing number of people are developing unhealthy eating and lifestyle habits, leading to a younger age trend of hypertension. Hypertension is one of the common cardiovascular diseases. Clinical manifestations include dizziness, headache, and in severe cases, it can cause retinopathy, intracranial hemorrhage, coronary artery atherosclerosis, and other diseases that may even threaten life. In terms of treatment, the main approach is to maintain stable blood pressure through medication, keeping it within the normal range. However, hypertension cannot be completely cured, and patients need to take medication for life [1].

Hypertension, as one of the common chronic diseases, brings both economic impact and medical burden to families and society. According to the latest report “China Cardiovascular Health and Disease Report 2022”, nearly 250 million adults in China suffer from hypertension, and the number of people with normal high values is as high as 435 million. Hypertension ranks first among the factors contributing to global disease mortality.

In modern medicine, the primary treatment method for hypertension is drug-induced blood pressure reduction. Western medicine can achieve rapid blood pressure reduction in the treatment of hypertension, and the effect is significant when combined with polypharmacy. However, it also has certain side effects.

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In the process of exploring better treatments for hypertension, people have gradually realized the efficacy and advantages of traditional Chinese medicine. As traditional Chinese medicine continues to explore and improve the treatment of hypertension, it has developed effective Chinese herbal decoctions such as Tianma WenDan Decoction, Tianma Gouteng Decoction, and Zhengan Xifeng Decoction.

This paper will explore the common components to find in various traditional Chinese medicine (TCM) formulations used for treating high blood pressure. By listing the ingredients of these TCM formulations,in order to identify the shared components and analyze their role in treating hypertension.

## 2. Common Chinese Herbal Formulas and Their Combinations.

**Table 1.** Common Traditional Chinese Medicine and Its Compatibility.

| Drug Name | Compatibility Formula and Medicine |
|---|---|
| Tianma Wenda Decoction [2] | Gastrodia elata, roasted licorice, tangerine peel, stir-fried Atractylodes macrocephala, raw dragon bones, French Pinellia ternata, Poria cocos, stir-fried Magnolia officinalis, raw oysters, Codonopsis pilosula, bamboo fungus, vinegar Chaihu, stir-fried Fructus Aurantii, stir-fried sour jujube kernels, sand kernels, cinnamon twigs |
| Decoction of Gastrodia and Uncaria [3] | Gastrodia elata,Gambir Vine,Eucommia ulmoides, Mulberry Parasite, Gardenia jasminoides, Scutellaria baicalensis,Leonurus japonicus Houtt Aurantiamide Acetate |
| Zhengan Xifeng Decoction [4] | Licorice, Radix achyranthis bidentatae,Haematitum, Raw dragon bones, Sheng Oyster, CarapaxTestudinisn, White Peony Root,Figwort , Radix Asparagi,Quercetin, Capillary Wormwood Herb, Raw grist |
| Banxia Baizhu Tianma Decoction [5] | Gastrodia elata,Gambir Vine, Licorice, Pinellia ternata, Poria cocos, Chineseyam,Atractylodes macrocephala, Coix seed, Daizhe stone, Platycodon grandiflorus, Chenpi, Pueraria lobata |
| Qingda granules [6] | Gastrodia elata,Gambir Vine,Scutellaria baicalensis, Lotus seed heart |
| Jianling decoction [7] | Gastrodia elata, Achyranthes, Oyster, Ochre, Rehmannia glutinosa, Pueraria lobata, Yam, Peony, Chrysanthemum, Dragon Bone, Cypress seed, Malt |

Through the analysis of Table 1, it is found that almost all of these traditional Chinese medicine preparations contain three medicinal herbs: Rhizoma Gastrodiae, Uncaria and Licorice. Therefore, it is inferred that these three medicinal herbs have a certain effect and therapeutic effect on treating hypertension.

## 3. The role of effective ingredients in traditional Chinese medicine in the treatment of hypertension

### *3.1. Effective ingredients in Gastrodia elata*

#### *3.1.1. Gastrodin*

As shown in figure1, gastrodia elata contains various components, among which the phenolic substances contained in Gastrodia elata have the most types and contents. The most important phenolic substances and the most effective single molecule component is Gastrodin($C_{13}H_{18}O_7$).

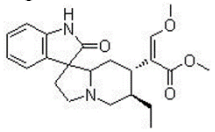

**Figure 1.** Structure diagram of Gastrodin

DOI: 10.54254/2753-8818/49/20241310

After 24 hours of treatment with Gastrodin it can activate protein kinase A (PKA) and subsequently open smooth muscle ATP sensitive potassium channels (KATP) to exert vasodilation effect [8,9].

*3.1.2. Gastrodia elata ethyl acetate extract III, IV and VIII*

Wang,Lil I [10]. Through mouse experiments to conduct experiments using total extracts of different concentrations of Gastrodia elata, Gastrodia elata ethyl acetate extracts, and Tianma water extracts, setting up three sets of control groups. By analyzing the results, it was found that the ethyl acetate extract of Gastrodia elata was the main active substance for vasodilation, which acted on the intact endothelium of mice and removed the endothelial rings. Extracts III, IV, and VIII of Gastrodia elata ethyl acetate can promote the release of NO (endothelial dependent relaxing factor) from endothelial cells. The NO released by the endothelium diffuses into the vascular lumen, increasing the activity of soluble guanylate cyclase (sGC) and increasing the content of cGMP, leading to reduced mobilization of calcium ions in vascular smooth muscle, thereby inhibiting vascular contraction, achieving vasodilation, and ultimately lowering blood pressure.

*3.2. Effective ingredients of Gambir Vine*

As shown in figure 2, the effective ingredient in Gambir Vine is Rhynchophylline.Rhynchophylline ($C_{22}H_{28}N_2O_4$) has the effect of vasodilation and the most significant effect of lowering blood pressure.

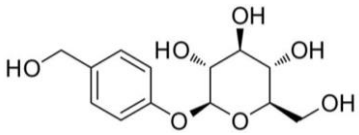


**Figure 2.** Structural diagram of Gambir Vine [11].

Tian, Lina [12] divided it into 5 groups through mouse experiments, including a model control group, a positive control group, and small, medium, and high-dose groups of Rhynchophylline. During the administration period, the mechanism by which Gambir Vine reduces blood pressure was determined by measuring the levels of angiotensin II (Ang2), AngII receptor (AT1R), NO, and HGF in mice.

The effect of Rhynchophylline is to reduce the content of ADMA, increase the content of HGF, and inhibit the increase of vasoconstrictor factor (ET-1), inhibit VECs (which can release various vasoconstrictor and vasoconstrictor factors), inhibit the binding of Ang2 and AT1R, and promote the expression of NO synthase (eNOS), promote the release of NO, play a role in vasodilation and lowering blood pressure [12].

*3.3. Active ingredients of licoorice*

As shown in figure 3, isoliquiritigenin is a highly selective β Estrogen receptor agonist, with a molecular formula of ($C_{15}H_{12}O_4$). Isoliquiritigenin can bind to extracellular receptors through nongenetic mechanisms, activate G protein coupled with receptors, which further activates sGC, causing an increase in cGMP and thus lowering blood pressure.

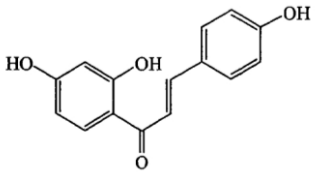


**Figure 3.** Structure diagram of Isoliquiritigenin [13].

Tian Weiwei [14] followed the principle of random control and divided 18 rats into a control group, a hypertension group, and an isoliquiritigenin intervention group. Before the experiment measure the blood pressure of each group of rats. The isoliquiritigenin intervention group was orally administered isoliquiritigenin to the rats every day, while the other two groups were orally administered an equal

DOI: 10.54254/2753-8818/49/20241310

amount of physiological saline water. After 21 days, the blood pressure of the three groups of rats was measured, and it was found that isoliquiritigenin had a significant effect on lowering blood pressure

Further research has shown that isoliquiritigenin can bind to extracellular receptors through non genetic mechanisms, activate G proteins coupled with receptors, and bind iron atoms located in sGC iron needle line to NO in vascular smooth muscle, causing sGC to detach from the needle line ring plane, activate sGC enzymes, increase cGMP content, activate PKG, dephosphorylate and activate BKCa channels, hyperpolarize cell membrane resting potential, and reduce extracellular Ca+influx. Reduce the intracellular calcium ion content In summary, isoliquiritigenin activates sGC enzyme to achieve dephosphorylation activation of BKCa channels, thereby reducing the influx of Ca+ ions, causing vasodilation, and achieving the goal of lowering blood pressure.

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## 4. Composition of Traditional Chinese Medicine Ingredients

Composition of Traditional Chinese Medicine Ingredientstraditional is importent in Traditional Chinese medicine. Traditional Chinese medicine compatibility is achieved through a reasonable combination of formulas and medicines, maximizing the effective effects of drugs while enhancing their efficacy and reducing their toxicity. So that it can also exert its efficacy while reducing side effects [15].

### *4.1. "Assisted by monarchs and ministers" in Traditional Chinese Medicine Compatibility*

"Assisted by monarchs and ministers" is very important in traditional Chinese medicine decisions, there should be not only the main therapeutic effect of the monarch medicine (main medicine) but also the minister medicine (auxiliary medicine) that can cooperate with the monarch medicine to achieve better therapeutic effects, as well as the adjuvant medicine that can treat concurrent symptoms or reduce toxicity. Its core is to increase efficacy and reduce toxicity. The assistance of main medicine and auxiliary medicine helps to balance the combined strength of all the formulas in traditional Chinese medicine, thereby enhancing the therapeutic effect in clinical treatment [15].

### *4.2. Analysis of Traditional Chinese Medicine "Decoction of Gastrodia and Uncariainclude"*

Decoction of Gastrodia and Uncariainclude include Sea-ear Shell and Cyathulae Radix. Sea-ear Shell has a liver clearing and heat clearing effect in this medicine. Studies have shown through high-performance liquid chromatography and in vitro testing that Shixiaming can inhibit the activity of angiotensinase (ACE). This component, when combined with the main drug, can significantly enhance its liver calming and latent effects [16].

Zhao, Lingli, et al. [17] demonstrated the antihypertensive effect of motherwort through network pharmacology and molecular docking technology, as well as searching for gene targets related to hypertension.Cyathulae Radix plays a role in promoting blood circulation and diuresis in this medicine. Leonurus japonicus Houtt can promote blood circulation and remove blood stasis. Both can increase the effect of promoting blood circulation and diuresis [18].

The common adjunctive ingredients in Decoction of Gastrodia and Uncariainclude include Eucommia ulmoides, Parasitic loranthus, Gardenia jasminoides, Scutellaria baicalensis, Leonurus japonicus Houtt, Tuber Fleeceflower Stem, and Aurantiamide Acetate. Nighttime vine and Aurantiamide Acetate have a calming effect on the mind and body.

Yuan Kaizhi, et al. [19] used the method of predicting effective targets and comparative analysis to study the network pharmacology of compatibility differences, and found that the combination of Cyathulae Radix and Eucommia ulmoides can produce a synergistic effect of efficacy.

Gardenia jasminoides and Scutellaria baicalensis have a cold nature and have the effect of clearing heat and reducing fire. Research has shown that the combination of the two can enhance the effect of reducing heat, and the effective components of geniposide and baicalin can reduce inflammation and

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protect nerves [20]. Various medicines are combined to achieve the effects of calming the liver, nourishing the liver and kidneys, clearing heat and promoting blood circulation

## 5. Conclusion

This article analyzes the mechanisms of action of four active ingredients, gastrodin, gastrodia elata ethyl acetate extract, rhynchophylline and isoliquiritigenin on vascular endothelium, and proves that all four active ingredients have the effect of lowering blood pressure. There are multiple types of hypertension, but this article only selects and discusses the roles of four Traditional Chinese Medicine Ingredients in the treatment of hypertension, without analyzing which specific type of hypertension is treated by different traditional Chinese medicine preparations. In the future will further understand.

This article analyzes the effect of active ingredients on hypertension, and the necessity of traditional Chinese medicine including verious ingredients. It has a positive significance for hypertensive patients to understand the effects of drugs, follow medical advice, and effectively control hypertension. There are still shortcomings in the purification of active ingredients in traditional Chinese medicine. will produce a large amount of waste residue, which generates a large amount of waste and can also affect the efficacy due to improper timing of decoction. Innovation is a booster for the development of traditional Chinese medicine. It is of great significance to innovate new purification technologies to improve drug efficacy and better promote the development of traditional Chinese medicine.

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