

## Identification and Pharmacological Action Analysis of Traditional Chinese Medicine Based on Chemical Composition Characteristics

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**Abstract:** The material basis of TCM treatment of diseases is TCM. The quality of traditional Chinese medicine will directly affect the safety and effectiveness of medical treatment. There are many kinds of Chinese medicines with complex specifications, and have different pharmacodynamics. Some medicines will have the same name but have different uses. These conditions have brought difficulties for Chinese medicine personnel to identify medicinal materials. Therefore, Chinese medicine personnel must have the ability to identify the authenticity of Chinese medicine and be responsible for the safety of drug use for the public. Based on this, this paper takes *Gastrodia elata* as an example to analyze the chemical composition characteristics of Chinese medicine for authenticity identification and pharmacological role, in order to provide useful reference for medical staff in the process of authenticity identification and pharmacological analysis of Chinese medicine.

### 1. Research background

#### 1.1 Literature review

According to Chinese historical records, *Gastrodia elata* can also be called the root of red arrow, which is a valuable medicinal material. *Gastrodia elata* has the shape characteristics of “parrot mouth” and “red pigtail” (Wang, 2016). *Gastrodia elata* as a perennial herb has the effect of dispelling wind, relieving pain and relieving liver and wind. *Gastrodia elata* has been used more and more in clinical medicine. *Gastrodia elata* has the functions of enhancing immunity, sedation, anti-thrombosis and delaying aging. *Gastrodia elata* does not cause any side effects, so it can be used repeatedly (Xu, 2003). *Gastrodia elata* has the characteristics of moisturizing and multi-fluid. It can effectively relieve headache and vertigo caused by blood deficiency and liver wind movement after taking it by sick patients, and has the effect of nourishing blood and restoring wind. *Gastrodia elata* can also be used to treat epilepsy and tetanus. Patients with headache, dizziness or numbness caused by wind-phlegm can use *Gastrodia* to help relieve their symptoms (Fan, 2016). In ancient China, *Gastrodia elata* was picked in the field, so its efficacy can be effectively guaranteed. But at present, the yield of wild *Gastrodia elata* is decreasing year by year, and it has become a rare medicinal material. Because of the preciousness and common use of *Gastrodia elata*, many illegal elements make huge profits by making false *Gastrodia elata*, but people do not have the ability to distinguish between genuine and false *Gastrodia elata*, so they are always liable to be deceived (Tan et al., 2016). *Gastrodia elata* is mainly grown in Sichuan, Yunnan, Guizhou and other places in China, in which the output of *Gastrodia elata* in Sichuan Province is the largest. In the late 1960s, the first artificial cultivation of *Gastrodia elata* was successful in China, and its output was sufficient for clinical medical purposes. Not only that, the artificial cultivation of *Gastrodia elata* in China can also be exported overseas. However, by comparing the yield of *Gastrodia elata* from different areas, we know that not only the quality of *Gastrodia elata* from different areas is different, but also there is a big gap between wild *Gastrodia elata* and planted *Gastrodia elata* (Xu and Wei, 2011). Therefore, in-depth study on the authenticity and pharmacological effects of *Gastrodia elata* by medical personnel will help to improve the quality of clinical medicine and promote the development of medicine.

## 1.2 Purpose of research

To ensure the quality of traditional Chinese medicine, first of all, we need to confirm the source of traditional Chinese medicine, so as to ensure the quality of traditional Chinese medicine from the source. Traditional Chinese medicine practitioners must identify the quality of traditional Chinese medicine by combining experience identification with modern physical and chemical identification methods. Experience identification of traditional Chinese medicine (TCM) is a summary of Chinese experience in identifying medicinal materials for thousands of years. Empirical identification method can effectively identify the quality of medicinal materials according to their shape characteristics. At the same time, the identification of traditional Chinese medicine should also be based on the analysis of the chemical constituents contained in the medicinal materials, so this paper takes *Gastrodia elata* as an example, through the analysis of chemical constituents to identify the authenticity of medicinal materials and analyze its pharmacological effects. *Gastrodia elata* is mainly parasitized on *Armillaria mellea* and grows in soil with high nutritional value and bushes with high humidity. *Gastrodia* is grown in Sichuan and Guizhou. Usually, the excavation is carried out after the winter, and the collected *gastrodia* is cleaned, steamed and air-dried. *Gastrodia elata* is one of the precious herbs commonly used in traditional Chinese medicine. *Gastrodia elata* contains many chemical constituents, and *gastrodin* is the most extracted chemical constituent. The most medicinal value of *Gastrodia elata* is also on *gastrodin*. *Gastrodin* has sedative and anticonvulsant effects, and its medical effect is very large. In addition, *Gastrodin* is non-toxic and can be used indefinitely. It is an indispensable medicine in traditional Chinese medicine.

## 2. Analysis of chemical components of *gastrodia elata*

The chemical constituents of *Gastrodia elata* have been studied in China for more than ten years. In the report on the chemical constituents of *Gastrodia elata*, several types of organic acids, phenols and phytosterols are included. Among them, the chemical constituents contain phenols, amino acids, polysaccharides, formers, fluorols, organic acids, and many trace elements needed by human body (Liu, 2014). Analysis of the fingerprint of *Gastrodia elata* shows that *gastrodin* is the most effective component of *Gastrodia elata*. Among them, a large number of Chinese *Gastrodia* related research scholars pointed out that the content of *gastrodin* is very high, basically reaching 0.33% - 0.67%. *Gastrodin* has the pharmacological effects of anti epilepsy, anti convulsion, sedation and hypnosis (Li, 2015). In addition, *gastrodin* is non-toxic and can be rapidly absorbed in the human gastrointestinal tract. It is mainly distributed in the kidney and then excreted mainly through urine (Yang, 2011).

## 3. Identification of *gastrodia elata*

The traditional Chinese medicines of *Gastrodia elata* with good quality are mainly produced in Yunnan-Guizhou Plateau and Sichuan Basin where the climate is humid and muggy. The geographical environment and climate of these two places are very conducive to the growth and multiplication of *Clostridium*. The natural nutrient of *Gastrodia elata* is *Clostridium*, which is directly related to the growth and quality of *Gastrodia elata*. The dry tuber part of *Gastrodia elata* is the most pharmacologically active part. Its shape is slightly curved and elliptical or long, and the surface is wrinkled. The length is generally about 3~15cm, the width is about 1.5~6cm, and the thickness is 0.5~2cm or so, the main color is yellowish white or yellowish brown, and irregular longitudinal wrinkles are distributed on the surface, with brown mold and spotted scales on the surface. The cross-section of the *gastrodia elata* shows a flat and bright feature, and the maternal exfoliation marks at the end of the *gastrodia elata* are more obvious. According to the classification of the *gastrodia* excavation time, the *gastrodia* can be divided into two types, summer hemp and winter hemp. Because of the short growth time and the more wrinkles, the summer hemp grows longer and the weight is heavier. Therefore, the pharmacological effect of winter hemp is better than that of summer hemp. *Gastrodia elata* can be divided into wild *Gastrodia elata* and artificially

cultivated *Gastrodia elata* according to the growth environment. Wild *Gastrodia elata* is better in texture, more tough and not easy to break, more earthy odor, brighter in color and taste than artificially cultivated *Gastrodia elata*. Artificially cultivated *Gastrodia elata* is mainly flat in shape and has more wrinkles in both vertical and horizontal directions.

In addition, the authenticity of *Gastrodia elata* can also be identified by physical and chemical tests. The specific operation steps are as follows: 1 g of *Gastrodia elata* sample is taken and ground into powder, the powder is dissolved in 10 mL of pure distilled water, diluted to 0.1 g/ml of *Gastrodia elata* solution, shaken well after 4 hours, and then filtered after 4 A, adding 2 drops of iodine solution to the filtrate, the color of the filtrate becomes wine red. Similarly, 0.5g *Gastrodia elata* samples were ground into powder and dissolved in 45% alcohol solution with 10 ml concentration. The solution was diluted to 0.2g/ml solution. After 4 hours, the filtrate was filtered. After mixing with alcohol solution, the filtrate was shaken uniformly. The maximum absorption wavelength of *Gastrodia elata* was 270 nm by ultraviolet spectrophotometer. At this time, the outer epidermal tissue of light brown *Gastrodia elata* can be clearly seen with a microscope. There are about three rows of embolized cells in the hypodermis. At the same time, calcium oxalate needle crystal bundles can be seen. The cortex composed of keratinocytes has massive substances in parenchyma cells. In iodine solution, it turns dark brown and round pulp cells can also be observed. The powder of *Gastrodia elata* is yellow-white or yellow-brown under microscope. Thick-walled cells are usually oval or polygonal, with a wall thickness of 3 9 m and a diameter of 70 190 M. The length of calcium oxalate needles is about 25 93 M.

#### **4. Pharmacological action of *gastrodia elata***

##### **4.1 *Gastrodia elata* has the effect of reducing blood lipid**

Experimental studies showed that mice fed with high fat diet could significantly reduce blood lipids by adding *Gastrodia elata* powder or gastrodin after gastric administration. Gastrodin can inhibit early atherosclerosis in mice. *Gastrodia elata* can reduce blood pressure level and protect the normal operation of cardiovascular system. The experimental study shows that the components of *Gastrodia elata* polysaccharide and Gastrodin which have the effect of lowering blood pressure are *Gastrodia elata* polysaccharide and *Gastrodia elata* L. In the process of testing rats, the researchers concluded that the dose of *Gastrodia elata* polysaccharide has a relatively high dose. The higher the dose of *Gastrodia elata* polysaccharide, the more obvious the decrease of triglyceride, which reduces the diastolic blood pressure and systolic blood pressure of rats. In the study, normal mice and hypertensive mice were used for control experiments, and different mice were intragastrically administered with Tianma solution. The results showed that Tianma had no significant effect on the blood pressure of normal mice, but the liver yang of hypertensive mice. The blood pressure of the upper jaw mice improved significantly. *Gastrodia elata* polysaccharide also has a significant antihypertensive effect on rats. Clinical evidence shows that continuous administration of *Gastrodia elata* powder to hyperlipidemia patients within a month can significantly reduce triglyceride levels in vivo, and no adverse reactions occur.

##### **4.2 Sedative and analgesic effects**

The results showed that the dosage of gastrodin could also affect the effect of anti-anxiety and convulsion. Gastrodin is non-toxic and can be excreted through urine. Some scholars have studied the pharmacology of Gastrodin. Some pharmacology of Gastrodin and Gastrodin were compared. By subcutaneous injection in mice, it was found that Gastrodin can enhance the blood flow of myocardium, enhance the anti-hypoxia ability of mice and sedate mice. Gastrodin was given to mice to reduce their activity and sleep time. In previous experiments, mice were injected with drugs by writhing method. The decrease of writhing times in mice could indicate that the dosage of *Gastrodia elata* was related to the analgesic and sedative effects. The larger the general dose, the more obvious the analgesic effect.

### 4.3 Strengthen immunity

It was found that gastrodin can enhance the phagocytic function of macrophages, and enhanced phagocytosis is beneficial to enhance the activity of serum lysozyme. In the experiment, increasing the dose of gastrodin can immediately increase the intensity of allergic reactions in mice, and enhance the immune function and non-specific immune function of mouse-specific immune cells. *Gastrodia elata* can regulate immunity. In the experiment, mice with decreased immunity were treated with *Gastrodia elata* polysaccharide for one week. The higher the dosage of *Gastrodia elata* polysaccharide, the greater the effect of improving serum hemolysin level in mice. High dosage of *Gastrodia elata* polysaccharide can protect immune liver function damage.

### 4.4 Improve memory

Gastrodin can enhance memory because it can inhibit P53 immunoreactive neurons in the hippocampus and inhibit the decline of P53 neurons in the hippocampus. Water maze test was used to study whether *Gastrodia elata* polysaccharides could improve learning and memory. Among them, *Gastrodia elata* polysaccharide dose group had shorter time to find the platform than normal group and vulnerable group. This is due to the effect of polysaccharides on the content of Ach in the brain of mice, thereby affecting the memory ability of mice. In the experimental process, the difference between the high dose group and the normal group reached a significant level, indicating that *Gastrodia elata* can increase the content of Ach in the brain, and has a certain effect on the improvement of memory.

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