

Research Progress on the Efficacy and Compatibility of *Pinellia Ternata*

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Abstract: *Pinellia ternata* has a clear nature, taste and channel, and is widely used in clinical practice. It is mainly used for various diseases caused by phlegm drinking. It is one of the commonly used Chinese herbal medicines by clinical doctors in ancient and modern times. Although ancient doctors have rich records on the compatibility application principles and related medicine of *Pinellia ternata*, today, when traditional Chinese medicine is modernized, there is a lack of effective sorting out of the pharmacological effects of *Pinellia ternata* compatibility on medicine. Through searching and sorting out the dictionary of traditional Chinese medicine prescriptions, this paper found that *Pinellia ternata* has obvious effects on anticoagulation, anti inflammation, anti-tumor, anti early pregnancy, sedation and hypnosis, and restricting toxicity. It can be seen that it is of great significance to clarify the pharmacological action mechanism and detoxification mechanism of Chinese medicine compatibility for clinical prescriptions.

Keywords: *Pinellia ternata*; Pharmacological effect; processing drugs

1. Introduction

Pinellia ternata (Thunb.) Breit Dried tubers of. It was first published in the book of Rites. Which said that born in May of the summer calendar, It's halfway through summer, so it's called *Pinellia ternata*. According to the records of traditional Chinese medical classics, it has the effects of drying dampness and resolving phlegm, reducing adversity and stopping vomiting, eliminating ruffian and loose knot, and relieving swelling and pain externally. It can be used to treat damp phlegm and cold phlegm, cough and asthma, phlegm drinking, dizziness and palpitation, wind and sputum dizziness, phlegm syncope headache, vomiting and nausea, chest and epigastric fullness, plum core Qi; External treatment of carbuncle, swelling and sputum nucleus. Because of its small toxicity, most of its processed products are taken internally. Due to different processing methods and excipients, its processed products are commonly *pinellia ternata*, *pinellia ginger* and *Pinellia ternata* etc^[1]. The compatible application principles and commonly used drugs of *pinellia ternata* are recorded in the ancient Chinese medical books, but there is still a lack of sorting out the pharmacological mechanism of its compatible application today.

2. Function and processing of *Pinellia ternata*

2.1. Study on taste efficacy of *pinellia ternata*

The nature, taste, efficacy and treatment system of *Pinellia ternata* are recorded in "Shennong Materia Medica Classic" raw valley^[2]. Supplementary Records of Famous Physicians" records its can eliminate the heart, abdomen and chest phlegm heart; cough reversed flow of qi; heart knot under the pain; distention and fullness; cough and reversed flow of qi, suddenly sore heart, sometimes suspiration, eliminate carbuncle swollen, feticide, treat impotent yellow; smooth appearance; aborticide. And classified the drug as inferior because of its toxicity. The Newly Revised Materia Medica of the Tang Dynasty summarizes and supplements the records of *pinellia ternata* in previous materia medica monographs: "*Pinellia ternata* is pungent, peaceful, slightly cold, warm and toxic. It is mainly characterized by typhoid cold and heat, firmness of the heart, Qi, sore throat, dizziness, chest distension, cough, phlegm heat in the abdomen and chest, cough, Qi, acute pain in the heart, tough ruffian, Qi sigh, eliminate carbuncle and swelling, abortion, treat flaccidity and yellow, and delight the face. Life makes people vomit, and cooked people make people purgation." The Song Dynasty's "Materia Medica Yanyi"

records that pinellia ternata can divide water and benefit the spleen."The Golden Book of Medical Science" concludes that pinellia ternata can "expel phlegm, diuresis, medicine for reducing Qi, stop vomiting, and dissipate the moisture under the threat."Ke Yunbo^[3] said: Pinellia ternata can "dispel the evil of Shangjiao and stop vomiting, and dispel ruffians and eliminate vomiting."

2.2. Study on pinellia ternata processing

Raw pinellia ternata is poisonous and spicy. In order to ensure the safety of drug use, we should pay attention to dialectics, compatibility and processing in clinical application. Because pinellia ternata tastes spicy and can disperse, all blood syndromes are forbidden; Its nature is dry and fierce, and it is afraid of hurting the body fluid, so it is forbidden for those with Yin deficiency and body fluid injury; Pregnant women should not use it. If necessary, they can "stir fry it with ginger". For specific usage, please refer to the "Supplement to the derivation of Materia Medica". There are records about the processing and detoxification of pinellia ternata in medical experts and herbal works of all dynasties. The earliest record can be seen in the Yellow Emperor's Internal Classic: "Flying thousands of times with flowing water"^[4] The "water washing" method was used until the end of the Tang Dynasty. In the late Tang Dynasty, ginger was used to restrict its toxicity, which was inherited and further developed in the Song, Jin and Yuan Dynasties. Pharmacopoeia of the People's Republic of China (2015 Edition) records the processing methods of different excipients such as licorice, lime, ginger and Baifan, and strictly standardizes the processing process, proportion of excipients and finished product specifications of different processed products of Pinellia ternata^[1].

2.3. Pinellia's modern pharmacology research

Pinellia ternata has complex components, mainly including starch, sitosterol, amino acids, alkaloids (including ephedrine, choline, trigonelline, etc.). Amino acids, volatile oils, aromatic and trace elements^[5], etc. Its alkaloids can inhibit the cough center and relieve cough^[6]. The antitussive effect of 0.6 g / kg Pinellia Decoction administered intravenously is close to that of codeine 1 mg / kg^[7], and 2.5 ~ 10g / kg Pinellia powder suspension administered by gavage to mice can effectively alleviate the cough caused by ammonia induced cough^[8-10]. Pinellia water decoction and alcohol extract can produce expectorant effect^[11] and anti peptic ulcer effect by continuous gavage in mice^[12], and Pinellia powder suspension can also have anti peptic ulcer effect^[13-14]; Pinellia Decoction alcohol preparation and alkaloid can effectively inhibit vomiting of radiotherapy^[15] and chemotherapy^[16], and Pinellia extract intravenously has antiarrhythmic and anticoagulant effects; Pinellia ternata also has anti-inflammatory, anti-tumor, anti early pregnancy, sedative and hypnotic effects, and glucocorticoid like effects^[17-20].

Pinellia ternata is a toxic medicinal material, mainly including mucosal irritation toxicity, hepatorenal toxicity, pregnancy toxicity, and mucosal irritation toxicity, That is, the "halberd man's throat" in the notes to the Collection of Materia Medica. Pinellia ternata make people numb the tongue, have breathing difficult and even die. At present, it is generally believed that the main components that cause mucosal irritation toxicity are calcium oxalate needle crystals and cohesin proteins^[21-22]. However, due to the complex components of pinellia ternata, whether its mucosal irritation toxicity is completely caused by calcium oxalate needle crystals and cohesin proteins needs further study; hepatorenal toxicity, that is, pinellia ternata can cause liver and kidney damage, including functional damage and pathological damage. It has been found through clinical and experimental research It is generally believed that it will cause liver and kidney damage when applied in high doses^[23-24]; Pregnancy toxicity, that is, Pinellia ternata can lead to the termination of pregnancy. It has been recorded in ancient herbal classics that "it should not be used by pregnant women". Modern pharmacological research has also shown that pinellia ternata can damage the fetus and even lead to the death of the fetus^[18,25-26]. However, some scholars have proposed that pinellia ternata has no adverse effect on the fetus^[27]. Ancient books such as the Synopsis of the Golden Chamber and the Golden Book of Medical records also have records of using Pinellia ternata to treat pregnancy vomiting.

3. Study on compatibility of Pinellia ternata

The main ways of medicine compatibility are single line, mutual reinforce, mutual force, mutual fear, mutual killing, mutual hatred and opposite. The purpose is mainly to reduce the toxic and side effects, enhance the efficacy and adapt to the needs of complex conditions. For toxic drugs, it is more important to enhance efficiency, reduce toxicity and make clinical drugs safer. It is of great significance for clinical application to clarify the pharmacological effects of drug compatibility and

master the detoxification mechanism and safe dose of toxic drugs. *Pinellia ternata* is one of the commonly used drugs in clinical practice. The raw product is toxic. If it is not processed or used in combination, it is easy to have toxic reactions. To clarify the pharmacological mechanism of its processing and compatibility can provide effective reference for clinical application.

3.1. *Pinellia ternata* and *Ginseng atractylodes*

Pinellia ternata is spicy, warm and good at dispersing. It is a good medicine for reducing Qi, removing phlegm, relieving boredom and eliminating caking. *Pinellia ternata* can reduce the syndrome of Stomach Qi inversion caused by phlegm stagnation. *Ginseng* and *Atractylodes* can strengthen the spleen and replenish qi, dry dampness and diuresis, so that the spleen is healthy and the phlegm cannot flow out. The three medicine phases must be used together. They can replenish qi and reduce qi, eliminating dampness, nourish the stomach, eliminate the source of phlegm, clear phlegm, reduce adverse Qi, and treat both the symptoms and root causes. For example, Zhu Danxi's *ginseng* and *Atractylodes* Decoction for treating spleen and stomach weakness and Qi deficiency hiccup, and Liu Junzi Decoction for treating spleen and stomach qi deficiency and phlegm dampness all use *Pinellia ternata* in combination with *ginseng* and *Atractylodes*. The main components of *ginseng* are ginsenosides, *ginseng* polysaccharides and volatile components, which have anti-aging, anti-Alzheimer's, anti-tumor and other effects, in traditional Chinese medicine theory, aging and dementia are mainly related to kidney essence, if the kidney essence is sufficient, it can be "both in shape and spirit" and "bright in ears and eyes", *ginseng* has the effect of tonifying vital energy, which is more convincing together with its modern pharmacological effects. *Pinellia ternata*, *Ginsenoside Rg3* and *Atractylodes lactones* have obvious anti-tumor, anticoagulant and anti atherosclerotic effects^[28-29]. In addition, some scholars believe that *Pinellia ternata* combined with *ginseng* will not lead to abortion, but will have the effect of solidifying the fetus. For example, Chen Xiuyuan said, "when *Pinellia ternata* and *ginseng* are used together, they will not affect the fetus, but can solidify the fetus." However, modern pharmacological studies have found that the compatibility of *Pinellia ternata* and *ginseng* is still toxic to mouse embryos^[30]. *Ginseng* can not restrain the poison of *Pinellia ternata*. It should be treated cautiously for pregnant women.

3.2. *Pinellia compatible rhizoma arisasmatis*

Pinellia ternata and *Rhizoma australis* are both spicy and warm, which are important drugs for treating phlegm, *pinellia ternata* is mainly used to treat damp phlegm and has the effect of relieve the fullness of the heart and descending Qi. *Nanxing* is good at treating wind phlegm and Quench wind and stop spasm. *Pinellia ternata* can dry dampness and strengthen the spleen to eliminate the source of phlegm, and *Nanxing* can eliminate wind phlegm in meridians and collaterals. The use of two traditional Chinese medicines together can increase the intensity of phlegm treatment, especially the effect of eliminating wind and phlegm. Both of them are Araceae plants, and their effective components and pharmacological actions are similar. They both contain choline, trigonelline, sterols and condensin, which have anti-tumor, sedative and anticoagulant effects. Both of them are toxic drugs, and their toxic mechanisms are similar, which are related to alkaloids, calcium oxalate needle crystals and other components^[31]. In clinical application, it is commonly used for internal administration, but the dosage and compatibility should also be paid attention to.

3.3. *Pinellia ternata* with white *Poria cocos* and tangerine peel

Pinellia ternata and tangerine peel are spicy and warm in nature. They enter the spleen meridian. *Pinellia ternata* is dry and phlegm wet and can strengthen the spleen. Tangerine peel can pass through the Sanjiao, regulate qi and harmonize the stomach. The so-called "treatment of phlegm first treats Qi", *Pinellia ternata* with the help of tangerine peel can smooth Qi and eliminate phlegm, especially in resolving phlegm and dampness; When tangerine peel is supplemented by *Pinellia ternata*, phlegm is removed and Qi flows from the bottom, and the function of regulating qi and stomach is more obvious. Doctors in the past dynasties believed that the two were expensive to store for a long time, so they were known as "two Chens". *Poria cocos* are sweet and mild in nature, sweet and can replenish the spleen, and light can infiltrate water and damp. *Pinellia ternata* is dry and damp, *Poria cocos* is diuretic, and tangerine peel is diuretic. When used together, they have the functions of drying dampness and resolving phlegm, strengthening the spleen and stomach, regulating qi and stopping vomiting. It is a commonly used drug pair for treating phlegm, dampness and turbidity. It can lower the upward Qi in the body, dry dampness and remove phlegm, regulate qi, strengthen the spleen and diuresis, treat both

symptoms and root causes, and have a significant effect. For example, *Pinellia ternata*, dried tangerine peel and *poria cocos* in the second Chen Tang have the same meaning.

Modern pharmacological studies have shown that carboxymethyl *Poria cocos* polysaccharide contained in *Poria cocos* can inhibit the secretion of HBsAg and HBeAg, protect against liver damage and promote hepatocyte regeneration^[32-33]. Combined with *Pinellia ternata*, it can inhibit the liver damage toxicity of *Pinellia ternata*, and has anti-tumor, anti-inflammatory, anti-aging and other effects. The combination of tangerine peel and *Pinellia ternata* can inhibit the expression of *eptl* and *srebf1*, activate the expression of *INSR*, *aco1* and *cyp4b1*, regulate glucose metabolism and lipid metabolism, and achieve the effect of removing turbidity and reducing lipid^[34]. Traditional Chinese medicine believes that the spleen controls the movement and transformation, which not only transports and transports the essence of water and grain, but also discharges the wastes after metabolism. Therefore, the spleen's failure to function properly will lead to the failure of normal transportation and excretion of excess sugars and lipids, which will accumulate in the body. Therefore, the treatment should focus on strengthening the spleen and stomach, resolving phlegm and lowering turbidity. The compatibility of tangerine peel, *Pinellia ternata* and *poria cocos* is just like this, which is also consistent with modern pharmacological research.

3.4. *Pinellia compatible with Angelica sinensis*

Angelica can replenish blood and regulate menstruation, promote blood circulation and relieve pain, and mainly treat various syndromes caused by blood deficiency and blood stasis. It can be used with *Pinellia ternata* to remove phlegm and blood stasis. It can be used to treat gynecological diseases caused by phlegm and blood stasis. The application of Huatan Tongmai Decoction in the treatment of polycystic ovary syndrome of phlegm Yin interaction type has a significant effect^[35]. The core drug that plays the role of resolving phlegm and removing blood stasis is *Pinellia sinensis angelica*, whose action targets are mainly prostaglandin endoperoxide synthase inducible gene (PTGS2) and progesterone receptor gene (PGR). PTGS2 is associated with a variety of reproductive functions and processes, including regulating ovulation, and can express COX-2. It can improve blood circulation, inhibit the release of inflammatory factors and regulate ovulation, so as to play the role of removing blood stasis and regulating menstruation. PGR plays an important role in female reproduction. Beta sitosterol and sigmastrl, the effective components of *angelica sinensis* -*Pinellia* drug pair, may mediate progesterone to regulate endometrial receptivity through PGR binding, which may be the key target and mechanism of *Pinellia* and *Danggui* in treating patients with polycystic ovary syndrome caused by insulin resistance^[36].

3.5. *Pinellia compatible with fresh Ginger*

Pinellia ternata has a good effect of lowering Qi and stopping vomiting. Ginger tastes spicy and warm. It is good at warming and dredging, warming the spleen and stomach, and stopping vomiting. The combination of the two can reduce the upward Qi of the human body and have better antiemetic effect. *Pinellia ternata* is toxic and must be used with ginger to improve its clinical application range and safety, because *Pinellia ternata* is afraid of ginger, which can restrict the toxicity of *Pinellia ternata*. The combination of the two is often used to treat vomiting caused by stagnation of water dampness and phlegm and poor rise and fall of Qi, such as Xiaobanxia decoction, a classic prescription for vomiting. The Golden Book of Medical Science said that it was "a prescription for treating vomiting caused by excessive phlegm". *Pinellia ternata* has mucous membrane irritation toxicity and reproductive toxicity. It is recorded in ancient herbal books that ginger can detoxify *Pinellia ternata*. Modern pharmacological studies have found that the mechanism may be that gingerol, the effective ingredient of ginger, inhibits the release of inflammatory factors and the generation and expression of reactive oxygen species (ROS)^[37-38]. Cai Honglin uses ginger *Pinellia ternata* decoction was given to pregnant mice by gavage to observe the development of embryos. It was found that the mother mice and their embryos were not affected by *Pinellia ternata* toxicity^[39]. It is proved that ginger has the effect of inhibiting the toxicity of *Pinellia ternata*.

3.6. *Pinellia compatible with magnolia officinalis and fructus aurantii*

Magnolia officinalis tastes pungent, bitter, and warm in nature. Bitter can lower Qi, and warm can replenish qi. Therefore, it can release solid fullness and disperse wet fullness. *Pinellia ternata* is spicy in taste, warm in nature, phlegm dissolving, dispersing and caking, and salivating is very slippery, so

Pinellia ternata falls. *Magnolia officinalis* can move Qi and help *pinellia ternata* to remove phlegm, and *pinellia ternata* to reduce adversity can also help *magnolia officinalis* to move Qi. The two medicine should be compatible, and they have the effect of moving Qi, reducing adversity and removing phlegm. The compatibility of *Pinellia ternata* and *Magnolia officinalis* Decoction and *Magnolia officinalis* (ginger, *pinellia*, liquorice and ginseng decoction) is what *Magnolia officinalis* means. The main components of *Magnolia officinalis* include various phenols, volatile oils and alkaloids. It has pharmacological effects of anti cerebral ischemia, anti-arrhythmia, anti-inflammatory, hypoglycemic, lipid-lowering and anti-tumor^[39-41]. It can effectively restrict the liver damage caused by *Pinellia ternata*^[42].

3.7. *Pinellia compatible schisandra*

Schisandra chinensis has the effects of astringency, invigorating qi and body fluid, tonifying the kidney and calming the heart^[1]. *Pinellia ternata* can reduce the adverse Qi of the human body, stop vomiting, remove dampness and phlegm, and eliminate caking. Sour and sweet *Schisandra chinensis* is a lung astringent and antitussive medicine, which causes the decline of lung qi to be attributed to the kidney. It is used in combination with the spicy, bitter and warm *Pinellia ternata* to treat cough, asthma, and thin sputum caused by cold drinks shooting into the lungs and lung failure, it also dissipates the caking, and treats the chest caking caused by phlegm stagnation in the heart and chest and blocking the Qi machine. The compatibility of the two drugs makes the powder have benefits, such as *Xiaoqinglong* decoction, which can help the opening and closing of lung qi and enhance the ability to stop cough and asthma, and prevent *Pinellia* pungent powder from warming and drying, consuming gas and hurting body fluid. Both drugs have the effect of dispelling and expelling water, *Schisandra chinensis* converges, *Pinellia ternata* reduces the Qi of the human body. *Shegan Mahuang* Decoction is effective in treating cough and asthma syndrome of Qi inversion, the symptoms are "cough and Qi inversion, and the sound of water cock in the throat". The above prescriptions and medicines are used to treat *Shangjiao Yang* disease, stagnant water consumption, and pulse floating without thirst^[43].

3.8. *Pinellia compatible with licorice*

Pinellia ternata is spicy, warm and toxic. The compendium of *Materia Medica* says that it is "mainly used for phlegm and abdominal distension...with a smooth body, spicy taste and warm nature." According to the book of *Materia Medica* classic, it can "get the gas of earth and gold, and also get the dry gas of heaven". Licorice tastes sweet and has the effects of nourishing the spleen and Qi, eliminating phlegm and cough, clearing away heat and toxin, and harmonizing various drugs. Those who taste sweet can replenish, harmonize and slow down ", just as the " *Materia Medica* "says:" licorice tastes sweet, has the property of neutralization, and has the ability to regulate and replenish. Therefore, poisons can be detoxified and strong medicine can be alleviated...The compatibility of liquorice and *Pinellia ternata* has two functions: first, it can alleviate its severe dryness and avoid hurting Yin. The main ways of medicine compatibility are mutual killing and mutual fear, that is, liquorice can kill the toxicity of *Pinellia ternata*, or saying that *Pinellia ternata* is afraid of liquorice; Second, licorice can replenish the spleen and replenish qi, dispel phlegm and stop cough, and enhance the expectorant power of *Pinellia ternata*, which is compatible with each other. Modern pharmacological studies have found that a variety of active ingredients in *Glycyrrhiza uralensis* have antitussive, expectorant and antiasthmatic effects. At the same time, glycyrrhizic acid can act with ephedrine in *Pinellia ternata* to strengthen the antiasthmatic effect.

4. Conclusion

Pinellia ternata, as a traditional Chinese medicine recorded and used in the period of *Shennong materia medica* classic, has a long history, a wide range of diseases and syndromes, and a remarkable effect. It is one of the commonly used Chinese herbal medicines in clinic. The book says that "pinellia tuber dominates harmony, moistens and dries, and communicates Yin and Yang". It also says that "pinellia tuber dominates Qi". In this paper, the efficacy and compatibility of *Pinellia ternata* were studied by consulting the literature and analyzing the data, with the aim of enhancing its efficacy, or specializing in its advantages, or slowing its bias, or even inhibiting its toxicity. We found that *Pinellia ternata*, combined with ginseng, *Poria cocos*, *Atractylodes macrocephala*, *Angelica sinensis*, tangerine peel, ginger, *Magnolia officinalis*, *Nanxing*, *Schisandra chinensis* and other traditional Chinese medicines, has obvious antitussive, antiemetic, anti-inflammatory, antiarrhythmic, sedative and

hypnotic effects, and restricts toxicity, which ensures the safety and universality of clinical medication to the greatest extent. It provides a clear basis for clinical prescription.

Because of its toxic effect, it is easy to lead to clinical drug safety problems, so the processing and compatibility problems are particularly important. Clarifying its pharmacological action mechanism can effectively grasp the compatibility law. The purpose of compatibility of traditional Chinese medicine is to enhance the efficacy of traditional Chinese medicine, specialize in its strengths, slow its bias, or suppress its toxicity. After sorting out the pharmacological action mechanism of *Pinellia ternata* and its commonly used compatibility drugs, we found that after compatibility, the toxicity of *Pinellia ternata* was effectively restricted, and it could produce different effects from its single Chinese medicine, and it had obvious effects in antitussive, antiemetic, anti digestive tract ulceration, anti arrhythmia, anticoagulation, anti-inflammatory, anti-tumor, anti morning rush, sedation and hypnosis, which guaranteed the safety of its medication to the greatest extent. Universality and reliability / it provides a clear pharmacological basis and opens up new ideas for clinical Daofang medicine. However, the compatibility and pharmacological mechanism of *Pinellia ternata* collected at present are not complete, and further exploration is needed to further promote the modernization of traditional Chinese medicine.

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