

# Li Dongyuan's Research on the Use of Spleen Drugs

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**Abstract:** In order to summarize and analyze the drug law of Li Dongyuan's prescription through data mining, we collected and organized the prescription data of Chinese medicine in Li Dongyuan's book "The Theory of Spleen and Gastrics". And we studied the mathematical statistical methods and associated rules, link chart analysis and etc of the frequency of the group drugs, such as four gas and five tastes, through data mining. Resultly, a total of 104 flavored drugs appeared in 63 prescriptions, with a total frequency of 555. Eight drugs were used more than 20 times, the core single taste drug in turn is Chenpi, ginseng, White atractylodes rhizome, Rhizoma, Chinese angelica, milk vetch, baked licorice, bupleuri, etc. The medicinal properties are mainly warm and supplemented by cold and flat. The taste of medicine is mainly pliant, bitter and sweet. Spleen, stomach, lung and liver are the main channels. The first 3 drug pairs analyzed by the association rules are: Chenpi-Milk vetch, Ginseng-Milk vetch, bupleuri-rhizoma. The R-cluster analysis results in 5 core groups. In conclusion, according to the function and nature of the spleen and stomach, combined with Li Dongyuan's Xingan drugs to raise the spleen and stomach Qingyang, the sweet cold medicine clear deficiency fire, these unique ideas have a certain guiding significance for medicine.

**Keywords:** Spleen and stomach theory; data mining; four properties and five tastes; Chinese medicinal meridian entry; Tonifying spleen and Promoting Yang

## 1. Introduction

Among the doctors who treated spleen and stomach diseases throughout the ages, there was a Jin Yuan physician who was later known as the "soil replenishing school", Li Gao, who wrote the classic work "Spleen and Stomach Theory" [1]. He studied the Yishui School of thought from Zhang Yuansu, and through studying related theories from "Huangdi Neijing", combined with the social environment at that time, he formed a unique theoretical theory, the spleen and stomach theory. Its academic ideas still have guiding significance for the treatment of modern spleen and stomach diseases. There are many famous recipes in "spleen-stomach theory", and today's doctors still have remarkable curative effects. For example, "ganwen deheat removal method" to treat fever in Buzhong Yiqi Decoction, is highly respected by later generations of doctors [2]. This shows the importance of using relevant techniques to analyze the drug characteristics in Li Gao's prescription. This study uses data mining technology to mine the formulas in "Spleen and Stomach Theory", and analyzes the frequency of commonly used drugs, four qi and five flavors, meridian and drug equivalence, so as to provide ideas for the diagnosis and treatment of spleen and stomach diseases in the diagnosis and treatment of prescription drugs.

## 2. Information and methodology

### 2.1. Research content

Derived from Li Gao's classic work "Spleen and Stomach Theory", through research and analysis, 63 first prescriptions meet the test standards. We use Excel for statistical, build relevant databases and dig through statistical software SPSS 26.0.

### 2.2. Data screening

When data are included, all medications covered in this book, regardless of dosage form, are included. The repeated prescription in the book is only taken once.

### 2.3. Data specification

For the study of classical ancient book groups, a unified standard must be established in the data collection work before the research, and the language selected in the "Spleen and Stomach Theory" must be converted with the language recognized by the computer as the standard, so that follow-up work can be carried out --- data mining. For the standardization of Chinese medicine names, it is mainly standardized from three aspects: typos, aliases and ellips.

Referring to the 2020 edition of the Pharmacopoeia of the People's Republic of China [3] and the Chinese Materia Medica [4] as the standard, the drug names in the prescription are standardized, and the format: before the specification - after the standard, such as Peel of *Trichosanthes kirilowii* - Fructus *trichosanthis* etc.

### 2.4. Data entry

The above prescriptions that meet the standards are entered into the software at the same time in accordance with the drug name specifications, and all the standardized prescriptions are entered into Microsoft Excel, and the composition database of "Spleen and Stomach Theory" is established, and the results are checked after the entry to ensure the accuracy of the data. Frequency statistics and Apriori modeling methods were used to analyze the frequency, four qi and five flavors, and attribution of drugs included in the formula, and the relevant complex networks and core formulas were displayed.

## 3. Results

### 3.1. Statistics of high-frequency drugs

A total of 63 formulas in Li Dongyuan's "Spleen and Stomach" were included in the study, involving 104 flavors of traditional Chinese medicine, with a total frequency of 555 occurrences. The Chinese medicines with a frequency > 15 in descending frequency were Chenpi (5.04%), ginseng (5.04%), Largehead *Atractylodes Rhizome* (4.32%), *rhizoma cimicifugae* (4.32%), Chinese angelica (4.14%), Milk vetch (3.96%), Baked licorice (3.96%), *radixbupleuri* (3.60%), Licorice (3.24%), and Chinese *Atractylod* (2.70%). And high-frequency drugs are also just like Li's combination of tonifying the spleen and promoting yang.

### 3.2. Analysis of drug four qi and five flavors

From the statistics of four qi and five tastes, it can be seen that warm drugs accounted for the most 49 times in the "Spleen and Stomach Theory", followed by cold drugs accounted for 27 times. The most used in the statistics of medicinal flavor are bitter, bitter and sweet, 63 times, 41 times and 36 times respectively. See Table 1 for details.

Table 1: Statistics of four qi and five taste in *Treatise on Spleen and Stomach*

Four properties	Frequency	Five tastes	Frequency
Cool	3	Spicy	63
Hot	8	Bitter	41
Flat	17	Sweet	36
Cold	27	Acid	9
Warm	49	Aalty	6
		Astrictive	5

### 3.3. Statistical results of drug attribution

It can be seen from the attribution results that the first most attributed menstruation is the foot taiyin and spleen meridian 54 times, the foot yang ming stomach meridian 45 times, followed by hand taiyin lung meridian 40 times, foot yin liver meridian 38 times. See Table 2 for details.

Table 2: Drug normalization statistics of Spleen and Stomach

Channel tropism	Frequency	Channel tropism	Frequency
spleen	54	heart	23
stomach	45	bladder	11
lung	40	gallbladder	7
liver	38	small intestine	4
kidney	30	pericardium	2
large intestine	27	tri-jiao	1

3.4. Drug association rules and R-type cluster analysis

The association drug pairs were obtained through the pharmacological map of the complex network, and the drug pairs linked ( $\geq 15$ ) were: chenpi and ginseng, ginseng and milk vetch, rhizoma cimicifugae and bupleuri, chenpi and milk vetch, Chinese angelica and milk vetch. Modeled by Apriori (confidence level 50, support degree 10, maximum number of first items is 2), the association analysis of common drugs obtained by three herbs mainly includes: licorice, chenpi, ginseng; chenpi, ginseng, milk vetch; angelica, milk vetch, ginseng and other main medicine pairs. See Table 3 for details. R-type cluster analysis was performed on drugs with frequency  $\geq 10$ , and five core groups of C1 were obtained: rhizoma cimicifugae, radixbupleuri, baked licorice, angelica, ginseng, milk vetch and chenpi. C2: Chinese atractylodes, golden cypress; C3: pinellia ternata, ginger, licorice, notopterygium, fandivaricate saphoshnikovia; C4: largehead atractylodes rhizome, poria cocos, alisma; C5: dried ginger. See Figure 1.

Table 3: Statistics of high-frequency drugs in the Journal of Spleen and Stomach

Serial number	Medicine	Frequency (rate %)
1	Chenpi	28(5.04)
2	Ginseng	28(5.04)
3	Largehead Atractylodes Rhizome	24(4.32)
4	Rhizoma cimicifugae	24(4.32)
5	Chinese angelica	23(4.14)
6	Milk vetch	22(3.96)
7	Baked licorice	22(3.96)
8	Radixbupleuri	20(3.60)
9	Liquorice	18(3.24)
10	Chinese Atractylodes	15(2.70)
11	Poria cocos	14(2.52)
12	Golden cypress	14(2.52)
13	Pinellia ternata	13(2.34)
14	Dried ginger	13(2.34)
15	Alisma	12(2.16)
16	Notopterygium	11(1.98)

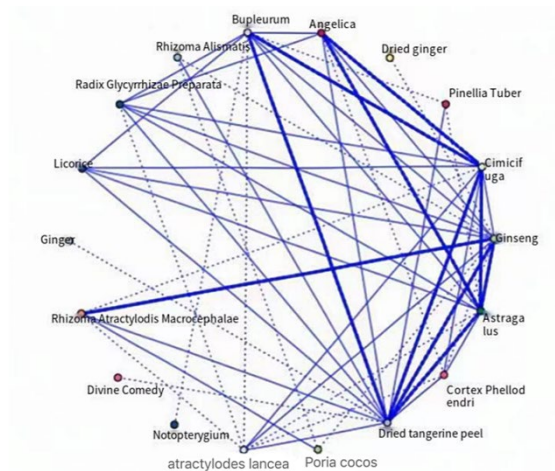


Figure 1: R-type cluster analysis pedigree

## 4. Discussion

### 4.1. Exploration of high-frequency drugs

Chinese medicines used more than 15 times: chenpi (5.04%), ginseng (5.04%), largehead atractylodes (4.32%), rhizoma cimicifugae (4.32%), angelica (4.14%), milk vetch (3.96%), licorice (3.96%), radixbupleuri (3.60%), licorice (3.24%), cangshu (2.70%). Among the drugs that appear frequently, chenpi and ginseng are more than 25 times, and other drugs that are more than 20 times, such as rhizoma cimicifugae 24 times, milk vetch 22 times, radixbupleuri 20 times, etc. These are also Li's famous prescription such as Buzhong Yiqi Decoction and Shengyang Yiwei Decoction and other indispensable drugs. From these drugs, we can also see that Li Dongyuan uses more drugs for tonifying the spleen and stomach in the treatment of the spleen and stomach, but fewer drugs for elevating yang qi. It can be seen that Li Dongyuan's treatment mainly focuses on tonifying the spleen, supplemented by promoting yang, such as the method of tonifying the spleen and promoting yang. In other parties, you can also see the general direction of nourishing the spleen and stomach and lifting yang qi.

As the acquired foundation of the body, the spleen and stomach is also the foundation of vitality, through its own function to gather the brilliance of qi and blood, produce the subtlety that nourishes the internal organs of the whole body, and is also the source of the subtlety of qi and blood and water valley. It can be seen that the normal operation of the function of the five internal organs is inseparable from the subtlety of the spleen and stomach. When the spleen's transport function is lost, yang qi can not grow and sink, jin liquid operation is abnormal, aggravate cold and humidity invasion of the spleen and stomach and damage yang, so the medicine is mostly sweet and warm sex of largehead atractylodes, ginseng, milk vetch, baked licorice to tonify qi. Therefore, for the diagnosis and treatment of internal injuries and miscellaneous diseases, Li's preference is to invigorate qi and raise yang, regulate qi machine, and the prescription drugs ginseng, largehead atractylodes, milk vetch and licorice are all qi tonic drugs, most of which are attributed to the spleen, stomach and lung meridians [5].

Li Dongyuan once proposed that in the five-element system, the two organs of mother and child will be sick to each other, or disorder of mother-organ involving its child-organ. If the spleen and stomach are insufficient, lung deficiency will occur. The sweet and warm qi-tonifying drugs can be taken, which can not only replenish the spleen and stomach qi, but also replenish lung qi, and can achieve the effect of cultivating native gold, such as milk vetch, ginseng and largehead atractylodes rhizome,

It reflects Li Dongyuan's idea of warming the spleen and stomach, taking into account lung qi, and preventing before illness. And spleen and stomach disease will consume yin blood for a long time, so use angelica to replenish blood and camp, chenpi as qi medicine, strengthen the operation of spleen and stomach qi, and have the function of replenishing without delay. Like other drugs, such as radixbupleuri, rhizoma cimicifugae and Chinese atractylodes, the first two flavors of wind medicine have the function of elevate Yang and regulate Qi [6]. But the meridian distribution is different (radixbupleuri taste bitter and slightly cold, into the liver, gallbladder, pericardium, three jiao meridian ; rhizoma cimicifugae flavor sweet and spicy slightly cold, into the lungs, spleen and stomach meridians and large intestine meridians), one left and one right, co-regulating activities of qi. The spleen likes dryness and dampness, and Chinese atractylodes can dry and streng then the spleen to help the spleen, and has the effect of dispelling rheumatism and sweating at the same time.

### 4.2. Analysis of Li Dongyuan's Four Qi and Five Flavors

Li Dongyuan proposed in the "Junchen Zuo Envoy Law" that the function of medicine is mainly based on its qi and taste, and the direction of the disease it treats is derived from its qi and taste [1]. From the statistics of the four qi, the most used is warm medicine, followed by cold medicine. The Shennong Materia Medica, which records the content of the "four qi", refers to cold, hot and cold. Warm and hot are yang properties; Cold and cool are yin attributes. As mentioned in the "Theory of Internal and External Wounds": "Warmth can remove great heat, and the medicine of bitter cold should not damage its spleen and stomach" [7]. When using xinwen to replenish the spleen and stomach and raise yang qi, use bitter cold to make xinwen dry, fearing that it will produce yin fire, which has the intention of sexual survival. In the most used in the statistics of medicinal taste is spicy, bitterness, sweetness, spicy taste can work, scatter, rise, Li believes that the spleen and stomach clear yang does not rise, the depression of the qi will have diarrhea, uterine prolapse, anal prolapse, leakage, blood in the stool and other symptoms. Sweet medicine has the effect of tonifying, neutralizing and harmonizing medicinal properties, and with spicy nature, it has the effect of singan and yang, so that the yang qi rises. The reason why bitter

medicine appears frequently is not that Li Dongyuan uses a large dose of bitter cold medicine to relieve his spleen and stomach, but when the yang qi is weak, the yin fire rises, and fever occurs, the medicine of sweetness and temperature is the mainstay, accompanied by the medicine of bitter cold to relieve his yin fire [8]. In "This Matter Is Hard to Know", Wang Haogu mentioned: "Xin is the taste of heaven, can make up for the division of the earth, from the top to the bottom, bitterness is the taste of the earth, can make up the difference of the heavens, from the bottom up to the above, both from its source" [9]. And the spicy taste is the taste of yang, but it also has the property of descending; Bitterness belongs to the taste of yin, and it also has the power of ascending, which can clearly explain the yin and yang attributes of the five flavors. As Zhang Element said: "Those who ascend and fall, the qi of heaven and earth intersects", all things are born in the sympathy of heaven and earth, and the rise and fall of qi leads to the metamorphosis and change of things [10,11]. "If the five wills are too extreme, they will turn into fire, damage the vitality and support the heart", and Li Shi put forward the view that "fire and vitality are not mutually exclusive" [12], believing that when the fire is too victorious, it will multiply the soil position, and the corresponding organs, spleen and stomach will be sick. From the data results, it can be seen that Li Dongyuan used Xingan drugs to raise the spleen and stomach to clear yang, and Ganhan drugs to relieve yin fire; The spicy taste rises to the spleen and stomach and clear the yang, accompanied by bitter taste, constructing the meaning of heaven and earth lifting qi intercourse.

#### **4.3. Analysis of drug attribution**

Among them, drugs are attributed to the spleen meridian (54 times), the stomach meridian (45 times), and then the lung meridian (40 times) and the liver meridian (38 times). First of all, the spleen and stomach are the central axis of the vitality circulation of the human body, as the acquired foundation of the human body, and at the same time, it is the source of water valley qi and blood biochemistry in the human body, which can replenish the acquired essence and also has the subtlety of nourishing the five internal organs. Similarly, the adequacy of vitality depends on the normal function of the spleen and stomach, which is the hub of the internal organs, in order to nourish the vitality. The lifting of the medium focus qi machine is based on the spleen and stomach as the hub of the internal organs, the transmission of water valley essence depends on the rise of the spleen, and the discharge of yin qi depends on the fall of stomach qi [13]. For example, "Lingshu Benshen Yun": "If the temper is weak, the limbs are not used, and the five internal organs are restless. And in the "Suwen Taiyin Yangming Theory": "The spleen and stomach are like soil, the rule of the center, raise four zang-organs in four seasons" [14]. In the movement of the spleen and stomach, the rise of the liver is conducive to the rise of the spleen, and the excretion of the liver is normal, which can help the spleen transport food and water. Because in the internal organ hub, the spleen and stomach complement each other, and the lifting is appropriate, so that the whole body qi machine can operate normally. The main function of the lung is to dispersal and drop to purify the qi of the surrounding body. Such as Yu Chang's "Medical Laws" summarizes that the purging function of the lungs is normal, and the whole body is smooth [15]. The human liver belongs to wood, the lungs belong to gold, and the liver qi rises and the lung qi falls. That is, the liver is the main rise, the lung is the main fall, and the lifting and lowering of the liver and lungs has a key role in the operation of the whole body qi machine [16]. This is particularly important in the internal organ operation hub, the normal rise and fall of the liver and lungs is particularly important, because the normal operation of qi and blood, jin liquid, spleen and stomach is related to it, once the two are lost in the rise and fall, the body's yin and yang imbalance will give rise to diseases. There are two aspects of liver drainage and abnormal rise, one is that the liver wood is too much, and the liver wood is multiplied by the soil, the other is that the liver wood is not enough, the liver drainage ability is reduced, the liver qi is deficient, and the wood deficiency is not loose the soil, which can cause the spleen and stomach to rise and fall irregularly, transport disorders, and the spleen and stomach are injured [17]. Li Dongyuan takes care of the spleen and stomach function, the smooth passage of the left and right elevators and yin and yang running of the human body, the spleen's lifting and clearing of the yang can really circulate and circulate, Li Dongyuan uses rhizoma cimicifugae and radixbupleuri, the clear yang of the liver and lungs, the yin turbidity of the spleen and stomach descends itself, and is not trapped by turbid gas.

#### **4.4. Drug association rules and R clustering analysis**

The two-flavor and three-flavor drugs used in "Spleen and Stomach Theory" summarize the following points, Li's preference is mainly to replenish the spleen and stomach qi, supplemented by some radixbupleuri and rhizoma cimicifugae to raise yang qi, so as to achieve better results. In the qi tonic medicine, ginseng and milk vetch are not only used as medicines, but also as holy medicines to remove muscle heat and heat, spleen deficiency to encourage qi, lung deficiency to replenish qi solid table. The

combined use of chenpi and milk vetch or ginseng has a tonic without stagnation, and has a neutralizing effect. rhizoma cimicifugae and radixbupleuri are two flavors of "wind medicine", described in Li Dongyuan's "the Spleen and Stomach theory": "Ephemeral yin fire, with all wind medicines, raise yang qi, to nourish the liver and gallbladder, is to make the yang qi rise, the upper part is in the yin part, and at the end with singan warm medicine to take its liter medicine, so that the fire diffuses in the yang part, and go out of the nine orifices" [18]. Angelica and milk vetch are the angelica blood soup of "The Theory of Internal and External Injuries", and Li Dongyuan also proposed in "The Theory of Spleen and Stomach": "If the people's spleen and stomach are insufficient, they are mostly blood diseases" [1], and milk vetch and angelica can directly enter the blood to remove the yin fire. R-type cluster analysis yielded 5 core groups, of which C1 was basically composed of tonic soup, indicating that the core group in "Spleen and Stomach Theory" was tonic and qi soup, and its idea of "sweet, warm and heat removal" was implemented in this book. The C2 square is Ermiaosan, which is mainly used to treat downward flow of damp-heat. The C3 side is mainly to dispel wind and dampness, and also reflects the use of Li Dongyuan's "wind medicine", wind overcomes dampness, and has the function of dryness and dampness [19]; There is also a large number of uses of wind medicine in Li Dongyuan's "Theory of Internal and External Wounds" [20]. The C4 side is mainly based on spleen moisture. C5 square dried ginger, has the use of warming spleen and yang to guard the middle of the focus. See Figure 2.

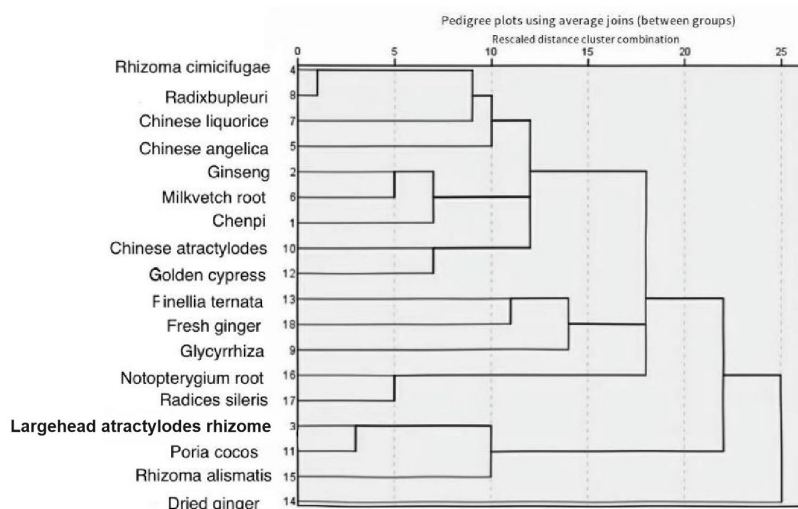


Figure 2: Core Prescription

## 5. Summary

Li Dongyuan has unique insights into the treatment of spleen and stomach diseases. Studying his ancient works can provide a good guidance direction for clinical medication and treatment academic ideas, and using big data mining can more accurately explore the general characteristics of his ideas. As the saying goes, "everything changes do not deviate from its origin". Through data mining analysis, it can be seen that Li Dongyuan's academic ideas have the following points: (1) Li Dongyuan focuses on warming and recuperating the spleen and stomach, pays attention to the effect of spleen and stomach lifting. When the lucid yang rises, the turbid yin falls on its own. "The lucid yang leads to upper body, and the turbid yin leads to lower body". (2) He focuses on adjusting the functional activity of qi in middle-jiao, supplemented by the effect of liver ascending function and lung depurative descending function. (3) The use of "wind medicine" in its 63 first squares is also very extensive, on the yang is rooted in yin, only in the yin fire, the wind medicine rises, can make the yang out of the yin and go to the yang part, there is the meaning of rising and clearing turbidity, ascending the yang to scatter fire, replenishing the spleen and stomach diarrhea yin fire. (4) According to the characteristics of the spleen and stomach, "like dryness and dislike dampness", the unique Yang Yang dehumidification method is used. We can also see through its medication characteristics that Li Dongyuan uses the four qi and five flavors of the drug to build the internal qi of the drug to supplement the diarrhea treatment of the internal organs, and the different attribution of the drug is different for the treatment of the disease before the disease is prevented, and the first safety is not affected by the evil organs, so that the target of the drug and the internal organs meridians entered are more accurate, and it can also be seen that his medication is ingenious and coordinated. In clinical application, we can combine the functions and characteristics of the spleen and

stomach, combined with Li Dongyuan's Xingan drug to enhance the spleen and stomach Qingyang, the sweet cold drug to diarrhea yin fire and drug gilding. These unique ideas have certain guiding significance for the diagnosis and treatment of spleen and stomach diseases.

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