

Original article

Analysis on application law of dampness-removing traditional Chinese medicines in treatment of coronavirus disease 2019

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ABSTRACT

Objective: Coronavirus Disease 2019 (COVID-19) has been diagnosed as an epidemic disease characterized by cold and dampness pathogens in TCM clinic. Due to many Chinese medicines with different functions were used in the treatment of COVID-19, it is very important to find the law of application of dampness-removing traditional Chinese medicine with high frequency application, with view to providing a reference for the use and research of Chinese medicine to further control the pandemic.

Methods: The publicly released diagnosis and treatment programs issued by the National Health Commission and Health Commission of provinces, autonomous regions and municipalities, and Chinese herbs prescription information in these were collected, a database was established, and Excel and Graphpad 8.0 software were used to analyze the frequency of use of various Chinese medicines, the frequency and property characters including five flavors (bitter, pungent, sweet, sour, and salty) and four natures (warm, hot, cool, and cold) and channel tropisms of Chinese medicine for removing dampness.

Results: A total of 137 prescriptions of Chinese medicine for treating COVID-19 were collected, including 178 TCMs showing functions of resolving phlegm, relieving cough and asthma, resolving dampness, clearing damp and inducing diuresis, clearing heat, tonifying deficiency, and relieving exterior syndrome, in which the TCMs with the first four functions that we called the dampness-removing TCMs, accounted for 35.78%. Also a number of TCMs in the rest functions showed removing-dampness. The first four functions were divided into subfunctions including aromatic resolving dampness, clearing heat and drying dampness, drying dampness and tonifying spleen *qi*, drying dampness and removing phlegm, inducing diuresis and relieving swelling, inducing diuresis and relieving exterior syndrome. Among them, the most frequently used TCMs was *Ephedrae Herba*, followed by *Citri Reticulatae Pericarpium*, *Pogostemonis Herba*, *Pinelliae Rhizoma*, *Poria*, *Scutellariae Radix*, and *Atractylodis Rhizoma*. The property character analysis in the dampness-removing TCMs showed that bitter and pungent were largely present and sour and astringent were absent, warm and hot were dominant; And the lung, spleen, stomach, large intestine, bladder were main channel tropisms.

Conclusion: Dampness-removing TCMs are the first important type of traditional Chinese medicine to be considered in the treatment of COVID-19 in Chinese medicine. The application of dampness-removing TCMs in the treatment of COVID-19 needs to be combined with its application law. This study may provide meaningful and useful information on further research to investigate the effective compounds from the dampness-removing Chinese medicine with high frequency application, and also provide a reference for the clinical treatment of COVID-19 accurately against dampness evil with dampness-removing traditional Chinese medicines.

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1. Introduction

Coronavirus disease 2019 (COVID-19) was with the characteristics of strong infectivity, rapid development and general susceptibilities, and seriously endangering people's lives and health around the world. In the fight against the COVID-19, traditional Chinese medicines (TCMs) were used in the early stage and participated in the whole process. As of March 23th, 2020, 74,187, or 91.5%, of the confirmed cases of COVID-19 nationwide used TCM, including 61,449, or 90.6%, in Hubei Province, China (Li, Hu, & Yu, 2020), and studies had confirmed that the combination of TCM could improve symptoms such as fever, cough, and weakness more quickly, shorten the number of days of hospitalization, improve the rate of nucleic acid conversion, and effectively reduce the number of light and the development of common type to heavy type and heavy type to critical type, improve the cure rate and reduce the death rate of disease (Huang, 2020). TCMs has made an important contribution to the comprehensive prevention and control of COVID-19, highlighting the unique advantages over the past thousands of years to prevent and control plague.

COVID-19 which caused infectious pneumonia and spread rapidly belongs to the category of "epidemic" in TCM. The records of epidemic diseases in TCM can be traced back to *Yellow Emperor's Internal Classic* more than 2250 years, and there are more than 320 large-scale plagues in China (Tong et al., 2020). TCM has accumulated a lot of experience in the prevention and treatment of epidemic diseases, and has created many prescriptions for prevention and treatment of epidemic diseases. In this process, many classic TCM books have also been produced, such as *Treatise on Febrile and Miscellaneous Disease*, *On Plague Theory*, *Detailed Analysis of Epidemic Warm Disease*, and so on. In 2004, a clinical study including 524 patients with severe acute respiratory syndrome (SARS) showed that the duration of major symptoms in the group of patients treated by integrated Chinese and western medicines was significantly shorter than those in the group treated by western medicine alone (Luo et al., 2020). During the process of fighting against COVID-19, the national and provincial health commissions had issued diagnosis and treatment plans, and provided Chinese medicine treatment prescriptions. Due to many TCMs with different functions were used in the treatment of COVID-19, it is very necessary to research the application law of TCM. According to the research and diagnosis by academician Xiao-lin Tong, the COVID-19 is a cold-damp epidemic, which is caused by the epidemic of cold-dampness (Tong et al., 2020). Therefore, it is very importance to research the law of application of TCMs from the aspect of damp-removing traditional Chinese medicine.

The dampness-removing TCMs refer to a class of herbs that can remove dampness. According to TCM theory, dampness, water and phlegm are homogeneous and heterogeneous, with dampness as the basis, dampness floods as water and gathers dampness into phlegm. Therefore, TCMs for removing dampness do not only refer to the damp-resolving medicines in the TCM efficacy classification, but all herbs that can facilitate water and phlegm can be classified as Chinese medicine for removing dampness. According to the pathogenesis of COVID-19, the basic pathogenesis can be summarized as follows: external invasion of epidemic virus, evil in the lung meridian, and deficiency of positive energy. The pathological nature involves dampness, heat, toxicity, deficiency, and stasis (Zhang, Wang, & Gu, 2020). Clinical findings showed that the tongue of patients with COVID-19 mostly shows signs of greasy moss, suggesting that the evil of the disease is closely related to dampness. If the moss is white and greasy, it is cold-damp; if the moss is yellow and greasy, it is damp-heat; if the moss is greasy and dry, it is damp-heat and dryness (Wang & Chen, 2020). It indicates that dampness

is the primary factor in COVID-19, and resolving dampness is the primary task in the treatment of COVID-19. Therefore, the application of TCMs for removing dampness is a natural choice for prescription medication. In this paper, we collected 137 prescriptions of formula for the treatment of COVID-19 from January 20th, 2020 to March 23th, 2020, and applied frequency analysis and other methods to analyze and study the frequency of the classification of TCMs for removing dampness, the characteristics of the pharmacological properties of TCMs for removing dampness, the characteristics of the combination application of TCMs for removing dampness, and other medication patterns, in order to provide a useful reference for the precise use of clinical treatment of COVID-19 and the development of innovative drugs. This study was conducted to provide useful reference for the precise use of drugs and the development of innovative drugs in the clinical treatment of COVID-19.

2. Data collection and analysis methods

2.1. Sources of information

This article collected 25 guiding documents such as the latest version of treatment plans, prevention and treatment plans, technical guidelines, etc. publicly released by the National Health and Wellness Commission and the Health and Wellness Commissions of 24 provinces, autonomous regions and municipalities directly under the Central Government, including Guangxi, Guangdong and Beijing, from January 20th, 2020 to March 23th, 2020, such as, the *National Health and Wellness Commission Treatment Plan for COVID-19* (Trial Version 7), *Guangxi Autonomous Region Bureau of Traditional Chinese Medicine on the Issuance of the Chinese Medicine Treatment Plan for COVID-19* (Version 3), *Beijing Municipal Chinese Medicine Treatment Plan for COVID-19* (Trial Version 3), etc., and additionally including *Hubei Provincial Hospital of Traditional Chinese Medicine Treatment Plan for COVID-19* (Version 3) and *Tongji Hospital of Tongji Medical College of Huazhong University of Science and Technology on COVID-19 Traditional Chinese Medicine Treatment and Prevention Program 2* treatment programs publicly released by medical institutions in Wuhan, Hubei Province.

2.2. Data processing

The information of prescriptions for treatment in each program was included, among which preventive prescriptions and proprietary Chinese medicines were not included, and the same prescriptions were combined. A total of 137 effective prescriptions are included, such as clearing lung and detoxifying soup, dispelling dampness, and declaring lung and detoxifying formula, involving 178 kinds of herbs, among which 58 kinds of herbs have the effect of treating dampness. A database was established, including the name of the prescription, the name of the drug, the classification of therapeutic effect, the nature and taste of the medicine, the efficacy and main treatment, the treatment methods and rules, and the disease stage and other information. According to the 2015 edition of the Pharmacopoeia of the People's Republic of China and the 13th Five-Year Plan textbook of the People's Health Publishing House, the 2nd edition of Traditional Chinese Medicine, the efficacy is classified and the names of each drug are unified, such as *raw Astragali Radix* is unified as *Astragali Radix*, *fried Atractylodis Macrocephalae Rhizome* is unified as *Atractylodis Macrocephalae Rhizome*, *raw Glycyrrhizae Radix et Rhizoma* and *moxibustion Glycyrrhizae Radix et Rhizoma* are unified as *Glycyrrhizae Radix et Rhizoma*.

2.3. Data analysis methods

By using software such as EXCEL and Graphpad 8.0, statistical analysis was performed on the frequency of use of various types of TCMs, the frequency of classification of dampness-removing TCMs, and the medicinal property characteristics of dampness-removing TCMs.

3. Analysis and summary of application law of TCMs for treatment of COVID-19

3.1. Application of various types of TCMs

In the traditional Chinese medicine prescriptions for the treatment of COVID-19, according to the classification of the efficacy of modern TCM, 17 categories of TCM were used, including heat-clearing, supplementing, phlegm-dissolving, cough and panting-relieving, among which six categories of heat-clearing medicines, supplementing medicines, phlegm-dissolving, cough and panting-relieving medicines, exterior-releasing medicines, damp-resolving medicines, and damp-draining diuretic medicines were mainly used, among these six categories, phlegm-dissolving, cough and panting-relieving medicines, damp-resolving medicines and damp-draining diuretic medicines accounted for 35.78% of the total frequency of use, while among the heat-clearing medicines, supplementing medicines and exterior-releasing medicines, a considerable number of herbs also had damp-relieving effects, the Chinese medicine for removing dampness used accounted for 52.27% of the total frequency of use, it can be seen that the use of TCMs for removing dampness is the primary choice of TCM formulas (Table 1).

3.2. Frequency analysis of TCMs for removing dampness-top 20 TCMs

In each prescription, a total of 61 TCMs for removing dampness were used, and the top 20 drugs are shown in Table 2. Among them, *Ephedrae Herba* induces sweating to release the exterior, diffuse the lung and relieve panting, promote urination and relieve swelling; *Citri Reticulatae Pericarpium* rectifies *qi* and fortify the spleen, dries dampness and dissolves phlegm; *Pogostemonis Herba* has the functions of resolving dampness, clearing summer-heat, and arresting vomiting; *Pinelliae Rhizoma* dries dampness and dis-

Table 1
Usage of various types of traditional Chinese medicines.

Serial number	Function classification	Frequency	Percentage/%
1	Heat-clearing medicines	330	20.54
2	Supplementing medicines	271	16.86
3	Phlegm-dissolving, cough and panting-relieving medicines	240	14.93
4	Damp-resolving medicines	191	11.89
5	Exterior-releasing medicines	180	11.20
6	Damp-draining diuretic medicines	144	8.96
7	Qi-rectifying medicines	75	4.67
8	Blood-activating and stasis-resolving medicines	53	3.30
9	Digestion-promoting medicines	44	2.74
10	Astringent medicines	21	1.31
11	Purgative medicines	18	1.12
12	Interior-warming medicines	13	0.81
13	Liver-calming and wind-extinguishing medicines	12	0.75
14	Resuscitative medicines	10	0.62
15	Tranquilizing medicines	2	0.12
16	Hemostatic medicines	2	0.12
17	Detoxifying and antipruritic medicines	1	0.06

solves phlegm, directs counterflow downward and arrests vomiting, disperses spleen and dissipates masses; *Poria* promotes diuresis to drain dampness, invigorates the spleen, and sedates the mind; *Scutellariae Radix* clears heat and dries damp, reduces fire to remove toxin, stops bleeding, calms the fetus; *Atractylodis Rhizoma* dries dampness, dispels wind-damp, releases exterior; *Tsaoko Fructus* dries dampness and dissipate cold, dispels phlegm and prevents attack of malaria; *Descurainiae Semen Lepidii Semen* drains the lung and relieves panting, moves water and diminishes swelling; *Coicis Semen* promotes urination and drains dampness, invigorates spleen to relieve diarrhea, clears heat and expels pus, eliminates impediment, which were mainly used to remove dampness.

3.3. Analysis of refined classification of efficacy of TCMs for removing dampness

According to the mechanism of removing dampness by TCMs for removing dampness, TCMs for removing dampness were classified and analyzed, and the results showed that the treatment of COVID-19 mainly involved the categories of damp-draining diuretic medicines, damp-resolving medicines, dry-dampness medicines, phlegm-dissolving medicines, and exterior-releasing overcome damp medicines. According to the effect of dampness medicine, a step-by-step analysis was carried out, and the damp-draining diuretic medicines include edema-alleviating diuretic medicines, heat-clearing and damp-excreting medicines, exterior-releasing promote urination medicines, supplement *qi* promote urination medicines, digestion-promoting and promote urination medicines, purgative and damp-excreting medicines, stranguria-relieving diuretic medicines, damp-excreting anti-icteric medicines, phlegm-dissolving promote urination medicines, and blood-cooling and promote urination medicines; damp-resolving medicines include aromatic damp-resolving medicines, invigorating spleen damp-resolving medicines, and heat-clearing and damp-resolving medicines; dry-dampness medicines include dry-dampness dissipate phlegm medicines, dry-dampness invigorating spleen medicines, and heat-clearing and dry-dampness medicines. These were the main types of dampness management drugs used: edema-alleviating diuretic medicines, exterior-releasing promote urination medicines, heat-clearing and damp-excreting medicines, aromatic damp-resolving medicines, heat-clearing and dry-dampness medicines, dry-dampness invigorating spleen medicines, and dry-dampness dissipate phlegm medicines (Table 3).

3.4. Medicinal property characteristics of TCMs for removing dampness

The five flavors involved in the treatment of COVID-19 used in the management of TCMs for removing dampness are bitter, pungent, sweet, light and salty, without sour and astringent tastes; among them, bitter and pungent medicines are predominate; among the four natures, warm, cold and neutral are all present, but warm-heat medicines are predominate, accounting for 56%; the meridians involve the lung, large intestine, spleen, stomach, heart, small intestine, bladder, kidney, liver and gallbladder, with the meridians of the lung, spleen, stomach, large intestine and bladder predominating (Figs. 1 and 2).

4. Discussion and prospects

TCMs have a long history of understanding and prevention of epidemics, and the names, transmission and prevention of epidemics have been recorded or systematically discussed in Chinese medical writings throughout the ages. For example, *The Yellow Emperor's*

Table 2
Top 20 TCMs used in dampness management.

Serial number	Drug names	Frequency of use	Medicinal properties	Effectiveness
1	<i>Ephedrae Herba</i>	52	Pungent, warm and lightly bitter; act on the lung and bladder meridians	Induce sweating to release the exterior; diffuse the lung and relieve panting; promote urination and relieve swelling.
2	<i>Citri Reticulatae Pericarpium</i>	49	Bitter, pungent and warm; act on the spleen and lung meridians	Rectify <i>qi</i> and fortify the spleen, dry dampness and dissolve phlegm.
3	<i>Pogostemonis Herba</i>	48	Pungent and slightly warm; act on the spleen, stomach and lung meridians	Resolving dampness, clear summer-heat, arrest vomiting.
4	<i>Pinelliae Rhizoma</i>	48	Pungent and warm; toxic; act on the spleen, stomach and lung meridians	Dry dampness and dissolve phlegm, direct counterflow downward and arrest vomiting, disperse spleen and dissipate masses. For exterior use, diminish swelling and relieve pain.
5	<i>Poria</i>	46	Sweet, bland and neutral; act on the heart, lung, spleen and kidney meridians	Promote diuresis to drain dampness; invigorate the spleen; and sedate the mind.
6	<i>Scutellariae Radix</i>	42	Bitter and cold, act on the lung, gallbladder, spleen, large intestine and small intestine meridians	Clear heat and dry damp, reduce fire to remove toxin, stop bleeding, clam the fetus.
7	<i>Atractylodis Rhizoma</i>	40	Pungent, bitter and warm; act on the spleen, stomach and liver meridians	Dry dampness, dispell wind-damp, release exterior
8	<i>Tsaoko Fructus</i>	32	Pungent and warm; act on spleen and stomach meridians	Dry dampness and dissipate cold, dispel phlegm and prevent attack of malaria
9	<i>Descurainiae Semen Lepidii Semen</i>	29	Bitter, pungent and extremely cold; act on the lung and bladder meridians	Drain the lung and relieve panting, move water and diminish swelling.
10	<i>Coicis Semen</i>	28	Sweet, bland and cool; act on spleen, stomach and lung meridians	Promote urination and drain dampness, invigorate spleen to relieve diarrhea; clear heat and expel pus, eliminate impediment
11	<i>Puerariae Lobatae Radix</i>	27	Sweet and cold; act on lung and stomach meridians	Clear heat and generate fluid, eliminate vexation and arrest vomiting, promote diuresis
12	<i>Atractylodis Macrocephalae Rhizome</i>	26	Bitter, sweet and warm; act on the spleen and stomach meridians	Supplement <i>qi</i> and invigorate spleen, dry dampness and promote urination, consolidate the exterior and arrest sweating, calm fetus
13	<i>Astragali Radix</i>	25	Sweet and slightly warm; act on the lung and spleen meridians	Supplement <i>qi</i> and raise <i>yang</i> , strengthen defensive and consolidate the exterior, promote urination to relieve edema, promote granulation
14	<i>Areca Semen</i>	24	Bitter, pungent and warm; act on large intestine and stomach meridians	Kill worms and disperse accumulation, move <i>qi</i> and promote urination
15	<i>Platycodonis Radix</i>	24	Bitter, pungent and neutral; act on the lung meridian	Diffuse the lung, dispel phlegm, evacuate pus and relieve sore throat
16	<i>Trichosanthis Fructus</i>	22	Sweet, slightly bitter, and cold; act on the lung stomach and large intestine meridians	Clear heat and dissolve phlegm, reinforce <i>qi</i> and relieve chest stiffness, dissipate mass and eliminate abscesses, moisten dryness to loosen bowel
17	<i>Rhei Radix et Rhizoma</i>	18	Bitter and cold; act on spleen, stomach large intestine, liver and heart meridians	Attack accumulation by purgation; clear heat and drain fire; cool blood and resolve toxins; expel stasis and promote menstruation flow; drain dampness and relieve jaundice
18	<i>Amomum kravanh Pierre</i>	15	Pungent and warm; act on the lung, spleen and stomach meridians	Resolve dampness and move <i>qi</i> , warm the spleen and stomach to arrest vomiting
19	<i>Notopterygii Rhizome Radix</i>	15	Pungent, bitter, warm; act on bladder and kidney meridians	Disperse wind-cold, overcome damp to relieve pain
20	<i>Fritillariae Thunbergii Bulbus</i>	15	Bitter and cold; act on the lung and heart meridians	Clear heat and dissipate masses; dissolve phlegm and relieve cough

Classic of Internal Classic records that the five epidemics are all similar, regardless of their size, and their symptoms are similar. *The Classic of Difficulties* records that there are five types of typhoid fever: stroke, typhoid fever, dampness and warmth, fever and warmth, and their sufferings are different. *The Treatise on the Origin of the Diseases* has made it clear that people who feel their perverse *qi* and develop diseases are multi-phase infections. *The Treatise on the Three Causes of the Disease* records that there are two epidemics, cold and temperature, and wind and humidity, which can be distinguished from each other. In *the Treatise on the Epidemic of Warmth*, it is recorded that the disease of the epidemic of warmth is not wind, not cold, not summer. And it is a different kind of gas between heaven and earth. *The Article on Warm Diseases* records that warm disease is an epidemic of hostile gas, mostly seen as filth, and it is like this in every family, as if it is a servant. *The Treatise on Timeless Diseases* records that warm is also warm heat, plague is also plague, its sound is the same but its disease is different. The diagnosis and treatment protocol of COVID-19 of the National Health Care Commission clearly indicates that COVID-19 belongs to the category of epidemic in Chinese medicine, and the cause of the disease is the feeling of epidemic and hostile *qi*. The theoretical understanding

of COVID-19 has not been fully unified in the academic community of Chinese medicine. For example, Yong-yan Wang et al. (Fan, Wang, Zhang, & Wang, 2020) considered it to be cold epidemic, Tong (2020) and Xue, Yao, and Xue (2020) considered it to be cold-damp epidemic, Bo-li Zhang (Liu et al., 2020), Qing-quan Liu (He et al., 2020) and Zhong-de Zhang (Miao, Cong, Wang, Wang, & Zhang, 2020) considered it to be damp poison epidemic, Zhong-ying Zhou (Ye et al., 2020) considered it to be plague poison upstream, Ji-bai Xiong (Chen et al., 2020) considered it to be warm-heat turbid poison, and so on. Although there are different opinions on the etiology and pathogenesis of this epidemic, there is a consensus on the importance of dampness as a cause and its pathogenic characteristics. Therefore, digging and analyzing the application pattern of dampness medicine can provide important reference for further prevention and treatment.

According to the results of the data analysis in this paper, the salient features of the medication used in TCM for the treatment of COVID-19 can be summarized. Firstly, large proportion of dampness-regulating herbs were used. In the TCM prescriptions for the treatment of COVID-19, six major classes of drugs, including heat-clearing medicines, supplementing medicines, phlegm-

Table 3
Frequency of application of classification of TCMs for dampness.

Categories	Frequency	Drugs and frequency of use
Damp-resolving medicines	Aromatic damp-resolving medicines	153 <i>Pogostemonis Herba</i> (48), <i>Magnoliae Officinalis Cortex</i> (38), <i>Tsaoko Fructus</i> (32), <i>Amomi Fructus Rotundus</i> (15), <i>Amomi Fructus</i> (12), <i>Eupatorii Herba</i> (4), <i>Moslae Herba</i> (2), <i>Silkworm Feces</i> (1), <i>Alpiniae Katsumadai Semen</i> (1)
	Invigorating spleen damp-resolving medicines	79 <i>Poria</i> (46), <i>Coicis Semen</i> (28), <i>Lablab Semen Album</i> (5)
	Heat-clearing and damp-resolving medicines	1 <i>Nelumbinis Folium</i> (1)
Dry-dampness medicines	Dry-dampness dissipate phlegm medicines	100 <i>Citri Reticulatae Pericarpium</i> (49), <i>Pinelliae Rhizoma</i> (48), <i>Citri Exocarpium Rubrum</i> (3)
	Dry-dampness invigorating spleen medicines	66 <i>Atractylodis Rhizoma</i> (40), <i>Atractylodis Macrocephalae Rhizome</i> (26)
	Heat-clearing and dry-dampness medicines	52 <i>Scutellariae Radix</i> (42), <i>Coptidis Rhizoma</i> (10)
Phlegm-dissolving medicines	107 <i>Platycodonis Radix</i> (24), <i>Trichosanthis Fructus</i> (22), <i>Fritillariae Thunbergii Bulbus</i> (15), <i>Asteris Radix et Rhizoma</i> (8), <i>Perilla Fruit</i> (7), <i>Peucedani Radix</i> (6), <i>Farfarae Flos</i> (5), <i>Sinapis Albae Semen</i> (4), <i>Bambusae Caulis in Taenia</i> (4), <i>Cynanchi Stauntonii Rhizoma et Radix</i> (3), <i>Fritillariae Cirrhosae Bulbus</i> (2), <i>Arisaema Cum Bile</i> (2), <i>Inulae Flos</i> (2), <i>Gleditsiae Fructus Abnormalis</i> (1), <i>Succus Bambusae</i> (1)	
Exterior-releasing overcome damp medicines	24 <i>Saposhnikoviae Radix</i> (8), <i>Notopterygii Rhizome et Radix</i> (15), <i>Angelicae Dahuricae Radix</i> (1)	
Damp-draining diuretic medicines	Heat-clearing and damp-excreting medicines	54 <i>Phragmitis Rhizoma</i> (27), <i>Lophatheri Herba</i> (13), <i>Artemisiae Annuae Herba</i> (7), <i>Imperatae Rhizoma</i> (2)
	Exterior-releasing promote urination medicines	54 <i>Ephedrae Herba</i> (52)
	Edema-alleviating diuretic medicines	44 <i>Descurainiae Semen Lepidii Semen</i> (29), <i>Succus Bambusaeng</i> (6), <i>Benincasae Semen</i> (5), <i>Alismatis Rhizoma</i> (4)
	Supplement qi promote urination medicines	25 <i>Astragali Radix</i> (25)
	Digestion-promoting and promote urination medicines	24 <i>Areca Semen</i> (24)
	Purgative and damp-excreting medicines	18 <i>Rhei Radix et Rhizoma</i> (18)
	Stranguria-relieving diuretic medicines	15 <i>Talcum</i> (8), <i>Tetrapanacis Medulla</i> (6), <i>Akebiae Caulis</i> (1)
	Damp-excreting anti-icteric medicines	11 <i>Polygoni Cuspidati Rhizoma et Radix</i> (9), <i>Artemisiae Scoparidea Herba</i> (2)
	Phlegm-dissolving promote urination medicines	10 <i>Mori Cortex</i> (10)
	Blood-cooling and promote urination medicines	3 <i>Verbenae Herba</i> (3)

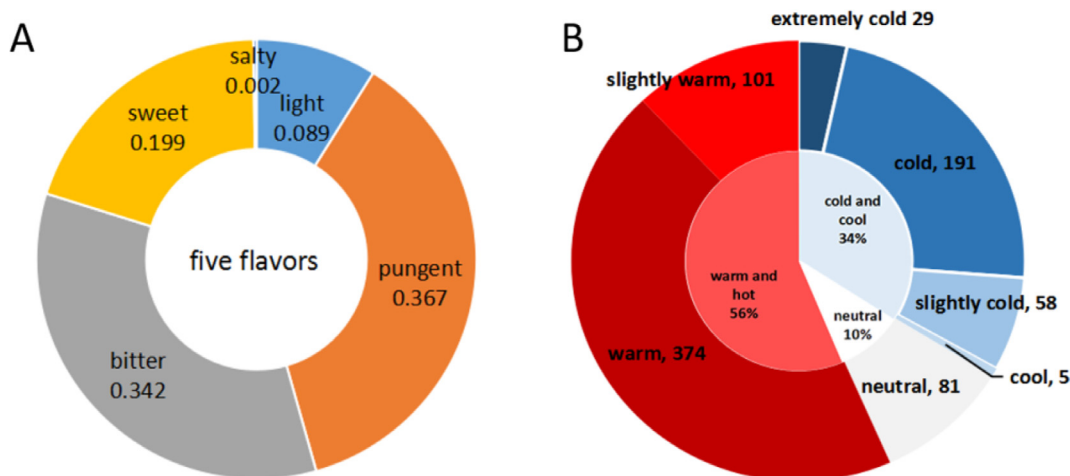


Fig. 1. Characteristics of five flavors (A) and four natures (B) of TCMs for removing dampness.

dissolving, cough and panting-relieving medicines, exterior-releasing medicines, damp-resolving medicines, and damp-draining diuretic medicines were the main drugs used; among

these six major categories, phlegm-dissolving, cough and panting-relieving medicines, damp-resolving medicines, and damp-draining diuretic medicines together accounted for 35.78%

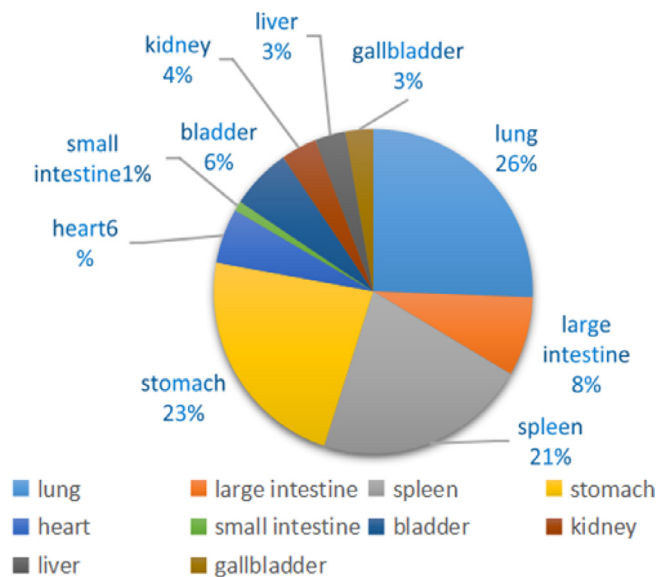


Fig. 2. Characteristics of meridian tropism of TCMs for removing dampness.

of the total frequency of use, while among the heat-clearing medicines, supplementing medicines and exterior-releasing medicines, there were also a considerable number of TCMs that also had damp-removing effects; the frequency of TCMs for removing dampness used accounted for 52.27% of the total frequency of use. The use of Chinese medicine for removing dampness is the primary choice of TCM formulations. The pathological nature of COVID-19 involves dampness, heat, toxicity, deficiency, and stasis, but dampness is in the first place, and the large proportion of Chinese medicine for removing dampness used also confirms the objective judgment that the core pathological mechanism of this epidemic is focused on dampness.

Secondly, High frequency application of aromatic dampness, pungent warmth to win dampness and bitter warmth to dry dampness type of dampness management herbs. The epidemic is caused by the invasion of cold and dampness with hostile *qi* into the population, either by attacking the surface of the body, resulting in fever, cold, headache, body pain and other superficial symptoms; or by entering through the mouth and nose, attacking the lungs, resulting in cough, asthma, chest tightness and other respiratory symptoms; or when cold and dampness directly hit the spleen and stomach, resulting in the failure of transportation and transformation, resulting in vomiting, nausea, diarrhea and other gastrointestinal symptoms (Tong et al., 2020). Cold dampness as a problem, the main warm medicine is in order to warm the water dampness; such as the *Inner Classic* records, dampness in the internal, the treatment should be bitter heat, with acid and light, with bitter dry; *Jin Kui Essentials* records that “diseases caused by phlegm and dampness should be treated with warm Chinese medicines and dampness is a *yin* evil and cannot be resolved without warmth”. At the same time, pungent and aromatic drugs, can aromatically open the orifice, dispel evil and go out, transform dampness and neutralize; as *Shennong's Classic of Materia Medica* recorded that incense, under the *qi*, the righteousness of the *qi* is strong to remove evil and obscenity. The results of this paper showed that the frequency of aromatic damp-resolving medicines accounted for 18.21% of the total number of TCMs for removing dampness; from the characteristics of the medicines, the majority of bitter and pungent TCMs for removing dampness accounted for 71%, while the majority of warm TCMs for removing dampness accounted for 56%, indicating that the high frequency application

of aromatic damp-resolving, pungent warmth to overcome dampness and bitter warmth to dry dampness type of TCMs. Removing dampness is crucial for the treatment of this epidemic. Among the 10 Chinese medicines for removing dampness used in high frequency applications, *Citri Reticulatae Pericarpium*, *Pinelliae Rhizoma*, *Pogostemonis Herba*, *Atractylodis Rhizoma*, and *Tsaoko Fructus* belong to this category. *Citri Reticulatae Pericarpium*, and *Pinelliae Rhizoma* are important medicines for drying dampness and resolving phlegm, which cannot only dry out dampness, but also reduce water retention in the lungs, so they are often used together and can be applied as removing dampness medicines. *Pogostemonis Herba*, *Atractylodis Rhizoma*, and *Tsaoko Fructus* are all aromatic damp-resolving medicinal, among which *Pogostemonis Herba* also has pharmacological effects in terms of anti-pathogenic microorganisms, anti-inflammatory, antipyretic, phlegmolytic and immune system regulation (Xu, Wu, Ding, & Xiu, 2017).

Thirdly, a variety of different and effective dampness management herbs are used in combination with each other. The results of the analysis showed that the proportion of damp-draining diuretic medicines used was high, amounting to 39.52%; the damp-draining diuretic medicines with different concurrent effects were involved, including 10 different subclasses of damp-draining diuretic medicines such as edema-alleviating diuretic medicines, heat-clearing and damp-excreting medicines, exterior-releasing promote urination medicines, supplement *qi* promote urination medicines, digestion-promoting and promote urination medicines, purgative and damp-excreting medicines and so on, this is a specific application of academic idea of Zhong-jing Zhang for treating dampness without facilitating urination is not its cure, which is one of the rules of treating dampness established in *The Essentials of Jin Kui*, in this treatment of COVID-19, which can help improve the effect of treating epidemic by facilitating the flow of water so that dampness can have a way to go.

Fourthly, the clearing of heat and drying dampness or cold, sweet and light dampness-liberating class of dampness-regulating herbs are frequently used. Dampness is a *yin* evil, the cause of the disease is insidious, with other evil *qi* mixed and become poisonous, rapid transmission, can enter the internal heat. If dampness enters the lung from the surface, dampness suppresses the lung guard and is seen as low fever, dry cough, tiredness and weakness, and soreness and heaviness of the limbs; if dampness and heat are combined, dampness suppresses the heat, so the body is hot and does not rise, the mouth is dry and not thirsty, the tongue is red and the coating is yellow and greasy; if dampness and heat are concentrated in Shao Yang, it is seen as cold and heat rising and falling, vomiting, bitterness in the mouth, distress in the heart, and fullness in the chest (Ye et al., 2020). The results of the pharmacological analysis showed that cold and cool herbs also accounted for a certain number of comparative cases in the dampness management herbs used, amounting to 34%; clearing heat and drying dampness or cold, sweet and light dampness class dampness management herbs were frequently used. Such as *Coptidis Rhizoma*, *Scutellariae Radix* and other heat-clearing and dry-dampness medicines, and cold or sweet and light water-liquid-permeating type of dampness-regulating drugs such as *Mori Cortex*, *Descurainiae Semen Lepidii Semen*, *Coicis Semen*, *Phragmitis Rhizoma*, *Lophatheri Herba* have a high frequency of use. This also suggests that in addition to the consideration of both efficacy, the anti-sexual combination is one of the key issues to be considered when using rheumatic drugs for the treatment of COVID-19.

Finally, Dampness management herbs with the effect of strengthening the spleen and tonifying *qi* are widely used. Among the TCM prescriptions for the treatment of COVID-19, supplementing medicines accounted for 16.86% of the frequency of use of all TCM, while dampness tonics such as *Astragali Radix*, *Poria*, *Atractylodis Rhizoma*, *Atractylodis Macrocephalae Rhizome*, *Citri Reticulatae*

Pericarpium, *Coicis Semen*, which have the functions of strengthening spleen and tonifying *qi*, were used more frequently, accounting for 19.64% of the frequency of use of all dampness tonics. In the causative factors of COVID-19, dampness is closely related to the spleen's function of transporting water and dampness in TCMs. The spleen prefers dryness rather than dampness, so external dampness will inevitably lead to internal dampness, causing the spleen to malfunction in transporting water and dampness, and most patients have digestive symptoms such as poor appetite and diarrhea. The application of herbs for strengthening the spleen and tonifying *qi* to regulate dampness is through the direct effect of dispelling dampness, or dry or beneficial to remove dampness from the body, on the other hand, through the effect of strengthening the spleen, so that the spleen and stomach can increase the function of transporting water and dampness, the source of internal dampness is reduced, and the existing dampness can be easily dispelled.

At present, the international epidemic is still spreading, the risk of importing foreign cases and domestic outbreaks again is high, and the epidemic prevention situation is still very serious. The use of TCMs for the treatment of COVID-19 should focus on the application of TCMs for the management of dampness, which is essential for the prevention and treatment of COVID-19, in particular, aromatic dampness, pungent-warm and bitter-warm dampness herbs, dampness herbs with different effects, dampness herbs with clearing heat and drying dampness or cold, sweet and light dampness herbs, dampness herbs with spleen strengthening and *qi* tonifying effects, and other dampness herbs are used in different stages, and scientific formulas are made by combining the antagonistic combination, five flavors and meridians of dampness herbs.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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