Comparison on the Origin and Development of *Sophora flavescens* in China and Japan

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Abstract *Sophora flavescens*, which was first recorded in *Shen Nong's Herbal Classic*, has the functions of clearing away heat, drying dampness, killing parasites and promoting urination. In its long-term application, traditional Chinese medicine has gradually deepened its understanding of the origin and efficacy of *S. flavescens*. In order to explore changes in the origin and efficacy of traditional Chinese herb *S. flavescens* in the history of China and Japan, in this paper, the origin and development of *S. flavescens* in China and Japan were compared from three aspects: the origin, medicinal efficacy, and processing methods of *S. flavescens* in China and Japan, hoping to provide clear understanding of the medicinal plant *S. flavescens*.

Key words *Sophora flavescens*; Japan; Herbalogical study; Processing

DOI: 10.19759/j.cnki.2164-4993.2024.02.015

Sophorae Flavescentis Radix is the dried roots of *Sophora flavescens* Ait., a leguminous plant[1]. It has been used for more than 1 800 years in China. It is mainly used for clearing away heat and dampness[2], killing parasites and relieving itching[3], resisting inflammation and subsiding swelling[4] in Modern Chinese medicine, and serves as a commonly used Chinese herb in China. The earliest reference can be found in *Shen Nong's Herbal Classic*, and many herbal works have described its source, growing environment, medicinal efficacy, harvesting and processing methods in detail. Traditional Chinese medicine was introduced into Japan in the 4th century[5], and Japanese traditional Chinese medicine was the most prosperous in the Edo period[6]. Many Chinese medical books were paid much attention to after being introduced into Japan, thus gradually forming a Japanese traditional Chinese medicine system, and the applied medicines under its guidance were called Han prescriptions[7]. With the passage of time and the change of medication habits of doctors in various countries, the description on the original plant and medicinal efficacy of *S. flavescens* has changed. Therefore, in this paper, a herbalogical study was conducted on *S. flavescens* in the two countries from three aspects: the original plant, efficacy and harvesting and processing methods of *S. flavescens*, aiming to explore the historical evolution and changes of *S. flavescens* in China and Japan and provide evidence for clarifying the source and modern medication of *S. flavescens*.

Received: February 19, 2024 Accepted: April 21, 2024

Supported by Anhui University of Chinese Medicine (2023LCTH18, 2021LCTH04); Fuyang Health Commission (FY2023-007).

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Historical Evolution of *S. flavescens* in China

Evolution and Changes of the original plant of *S. flavescens*

During the Han Dynasty, *S. flavescens* was recorded for the first time in *Shen Nong's Herbal Classic*[8], and it was listed as a medium-grade herb. It was recorded in the book: It is also known as a Shuihuai and Kushi. It grows in valleys and fields. Here, it was recorded that *S. flavescens* is also known as Shuihuai, grows mostly in valleys and fields and tastes bitter, but there was no record of its genuine producing areas. Later, *Supplementary Records of Famous Physicians*[9] said: It is also known as Dihuai, Tuhuai, Jiaohuai, Jing, Huma, Cenjing, Lubai, and Linglang; and it grows in Runan and the fields. It also shows that *S. flavescens* mostly grows in fields and mountains and plains, and looks like a locust tree, and it clearly shows the distribution areas of *S. flavescens*, which may be the area of Runan County, Zhumadian, Henan Province in modern times[10]. The records and descriptions in the Southern and Northern Dynasties and the Tang Dynasty are similar to *Shen Nong's Herbal Classic*, and there is no big change. *Bencao Tujing* (*Illustrated Classic of Materia Medica*) of the Song Dynasty has a more detailed description of *S. flavescens*, and it[11] said: *S. flavescens* grows in valleys and fields in Runan, and it now appears everywhere today. Its roots are yellow, 5 to 7 cun long, two fingers thick; three or five stems grow together, and the seedlings are three or two feet high; there are many green leaves, very similar to *Sophora japonica* leaves, and hence it has the name of Shuihuai, and these leaves grow in spring and wither in winter; and its flowers are yellow and white, and it bears fruit like small beans in July. Here, there is a detailed morphological description of *S. flavescens*, and the growth environment is basically the same as that recorded before, that is, fields and places near to roads; but for the shape of *S. flavescens*, it is roughly described as the roots show yellow section and are two fingers thick; generally, there are three or five stems growing from the roots, and the leaves are green and looks like *S. japonica* leaves; and the flowers are

yellow and white, and it begins to bear fruit in July, and the fruit looks like small beans. It can be seen here that the plant is very similar to the current medicinal plant *S. flavescens*.

In modern times, *Great Dictionary of Traditional Chinese Medicine*[12] described: Kugu (*Compendium*), Chuanshen (*Guizhou Minjian Fangyaoji*), Fenghuangzhua (*Guangxi Zhongshouyi Yaozhi*) and Niushen (*Hunan Yaowuzhi*). *Chinese Materia Medica*[13] also recorded: Kugu, Chuanshen, Fenghuangzhua, Niushen, Digu, Yehuaigen, Shanhuaigen and Dishen. According to the latest 2015 edition of *Pharmacopoeia*, Sophorae Flavescentis Radix refers to the dried roots of *S. flavescens*, a leguminous plant. From this, we verified that *S. flavescens* was first recorded in *Shen Nong's Herbal Classic*, which described that *S. flavescens* is also known as Shuihuai and Kushi, and later herbal records are also similar to *Shen Nong's Herbal Classic*. It can be seen that since *S. flavescens* was recorded for the first time, its plant morphology is similar to *S. japonica*, and it has bitter roots, yellow and white flowers and three or five stems, which is basically the same as the statement that Sophorae Flavescentis Radix refers to the dried roots of *S. flavescens*, a leguminous plant, in *Pharmacopoeia*. Ancient herbal books recorded that *S. flavescens* grows in places near to roads and in fields everywhere. Today's *Flora of China*[14] also has a description: it is produced in northern and southern provinces of China. It grows on mountain slopes, in shrubs on sandy slopes or near fields, with an altitude lower than 1 500 m. It can be seen that *S. flavescens* has a wide distribution range, and its growth environment includes low-altitude areas and low mountains and hills.

Evolution and changes of efficacy of *S. flavescens*

Shen Nong's Herbal Classic[8] of the Qin and Han Dynasties firstly recorded that: *S. flavescens* is mainly used for treating abdominal qi stagnation, abdominal mass accompanied by abdominal distension and abdominal pain, jaundice, and feeling of uncleanness after urine, and using *S. flavescens* to eliminate water dampness can eliminate carbuncle and swelling, tonify the spleen and stomach and regulate the middle energizer, make eyes see things clearly and stop crying. *Shen Nong's Herbal Classic* recorded that the efficacy of *S. flavescens* is mainly to disperse qi stagnation and jaundice, improve eyesight and stop tears, which is related to the bitter and cold nature of *S. flavescens*. *Supplementary Records of Famous Physicians*[9] said that: *S. flavescens* has the effects of nourishing liver and gallbladder qi, protecting five organs, stabilizing the mind, replenishing the essence of the human body, dredging the nine important acupoints of the human body, eliminating latent heat and dysentery, quenching thirst, dispelling the effects of alcohol, improving yellow and red urine, treating malignant sore and lower part ulcer, promoting movement of the stomach qi and regulating stagnation in the stomach, and making people crave food and fell easy and relaxed. At this time, the efficacy was slightly different from previous records, but it was well documented in the previous medication habits to use its bitter and cold nature and flavor to remove heat and quench thirst and promote qi and treat sores.

Newly Revised Materia Medica in the Sui and Tang Dynasties recorded[15] that: *S. flavescens* is mainly used for treating abdominal qi stagnation, abdominal mass accompanied by abdominal distension and abdominal pain, jaundice, and feeling of uncleanness after urine, and using *S. flavescens* to eliminate water dampness can eliminate carbuncle and swelling, tonify the spleen and stomach and regulate the middle energizer, make eyes see things clearly and stop crying. It also has the effects of nourishing liver and gallbladder qi, protecting five organs, stabilizing the mind, replenishing the essence of the human body, dredging the nine important acupoints of the human body, eliminating latent heat and dysentery, quenching thirst, dispelling the effects of alcohol, improving yellow and red urine, treating malignant sore, promoting movement of the stomach qi and regulating stagnation in the stomach, and making people crave food and fell easy and relaxed. [Careful investigation] *S. flavescens* treats leg weakness and kills evil parasites. The seeds are harvested in October, and taken by the method for the seeds of *S. japonica*. It has been proved that if you take it for a long time, you will be agile in activities and have good eyesight. At this time, the parasite-killing efficacy of *S. flavescens* was recorded for the first time. *Rihuazi Materia Medica* in the Five Dynasties and Ten Kingdoms period[16] said that: "*S. flavescens* can cure malnutrition by destroying parasites. *S. flavescens* is fried until smoke appear, and then taken for treating the symptom of discharging fresh blood stool and heat dysentery. At this time, the usage of *S. flavescens* in treating heat dysentery was recorded, which is a medication method more detailed than the above materia medica. Later, in the Ming and Qing Dynasties, the records of medicinal effects of medicinal herbs in previous herbal works were summarized, including treating sores, killing parasites, treating jaundice, improving eyesight and stopping tears, providing a good reference for the use of *S. flavescens* in later generations. After the Sui and Tang Dynasties, the Ming and Qing Dynasties followed the previous medication experience, and the records about the medicinal efficacy of *S. flavescens* were not much different from before.

In modern times, *Chinese Materia Medica*[13] recorded following effects: ① anti-tumor effect, ② leukocyte-raising effect, ③ cardiovascular system effect, ④ antiasthmatic and expectorant effect, ⑤ antiallergic effect, and ⑥ immunosuppressive effect. *China Pharmacopoeia* (2015 edition)[1] recorded: *S. flavescens* has the effects of clearing away heat and drying dampness, killing parasites and promoting urination. It can be used for treating dysentery, bloody stool, jaundice, urodialysis, urinary incontinence, leukorrhea with reddish discharge, swelling and itching of the vulva area, eczema, eczema, skin itching, scabies and leprosy, and for external treatment of trichomonal vaginitis. The efficacy of treating heat dysentery, clearing away heat, removing abscess and killing parasites recorded in modern times is basically the same as that recorded in *Materia Medica* books of past dynasties, which shows that *S. flavescens* has always been a commonly used Chinese

medicine for doctors. Because of its bitter and cold characteristics, clearing away heat and toxic materials, killing parasites and relieving itching, reducing swelling and treating sores are undisputed medication experience.

Evolution and changes of harvesting and processing methods

The harvesting and processing of *S. flavescens* in the Han Dynasty, the Southern and Northern Dynasties and the Tang Dynasty were recorded as "The roots are harvested in March, August and October, and dried by exposing to the sun". That is to say, the roots of *S. flavescens* are harvested in spring and autumn every year and dried for medicinal purposes. Until the Song Dynasty, *Leigong Paozhi Lun*[17] recorded that: Leigong said: when using *S. flavescens*, no matter how much, it must be first soaked in thick glutinous rice water for one night to let the fishy and impure flavor float on the water, and must be washed for several times and steamed from 9:00 a. m. to 13:00 p. m., and then, the steamed roots are taken out, dried in the sun, and powdered finely for use. As a monograph on the processing of traditional Chinese medicine in China, *Leigong Paozhi Lun* improved the processing method of *S. flavescens* for the first time, from collecting roots and sun-drying to soaking in glutinous rice juice for one night, filtering, steaming for six hours, drying in the sun, and powdering finely. The process was more complicated than before, but it created a precedent for the processing method of *S. flavescens* and had a great influence on the processing technique of *S. flavescens* in later generations. At this point, the herbal works in the Qing dynasty basically continued the processing technique records of *S. flavescens* in the theory of *Leigong Paozhi Lun*.

In modern times, with the development of science and technology and the application of machines, the processing method has gradually realized semi-automation. For example, in the *Dictionary of Traditional Chinese Medicine*[12], it was recorded as: picking out impurities, removing residual stems, washing to remove soil, soaking in water until the material is moistened thoroughly, taking out, slicing and drying in the sun. In recent years, there have been new records about the processing method of *S. flavescens*. The method of soaking overnight in glutinous rice water is changed to soaking in water until it is moist, slicing and drying in the sun. It can be seen that with the development of people's manufacturing tools and the change of drug demand, the manufacturing technique has been simplified. *Chinese Pharmacopoeia* (2015 edition)[1] recorded: *S. flavescens* is dug out in spring and autumn, and the root tips and small branches are removed to get roots, which are washed and dried. Or the material is sliced and dried while fresh. The harvest period of *S. flavescens* is consistent with its growth characteristics, and the plant nutrition and characteristic metabolites are enriched in the roots in spring and autumn, which ensures the reliability of curative effect.

Brief summary

According to the above textual research of materia medica, it can be seen that *S. flavescens* was first recorded in *Shen Nong's Herbal Classic*. It was always been recorded that it looks like *S. japonica* and its roots are bitter. Later on, it also continued to use its nicknames such as Kuhuai and Dihuai. Later, it was recorded that it has yellow and white flowers, yellow roots and green leaves, which is consistent with the results of plant taxonomy research that *S. japonica* and *S. flavescens* are both leguminous plants today. It indicates that the medicinal varieties of *S. flavescens* have not undergone great changes since ancient times. And its medicinal effects are the same from the treatment of jaundice, sores, and carbuncle recorded in *Shen Nong's Herbal Classic* to the increase of parasite-killing and antipruritic effects in later generations. Up to now, Qingre Tonglin Tablets can clear away heat and remove fire[18], and compound Huangbai Kushen Lotion can treat trichomonal vaginitis[19], and Qingre Yangxin Granules has anti-inflammatory and anti-viral effects[20], which are the current use status of *S. flavescens* with the functions of clearing away heat and toxic materials, killing parasites and resisting inflammation. In terms of processing technique, before *Leigong Paozhi Lun* in Song Dynasty, it was roughly described as taking roots and drying them, but in Qing Dynasty, the method including steps of soaking in glutinous rice water, filtering and sun-drying in *Leigong Paozhi Lun* was an improvement to the processing method of *S. flavescens*, although it was time-consuming and laborious. In modern times, continuous improvement has been made on this basis by replacing glutinous rice water with water. Currently, the method of directly slicing and drying is commonly used, which has various reasons, but cannot be separated from convenience factors, and may be related to the common cultivation varieties of *S. flavescens*. In a word, *S. flavescens*, as a commonly used Chinese herb in China, has been recognized by the broad masses of people for its efficacy, and its origin and purpose of medication have not changed much, but its effective components and mechanism of action still need to be improved in modern research.

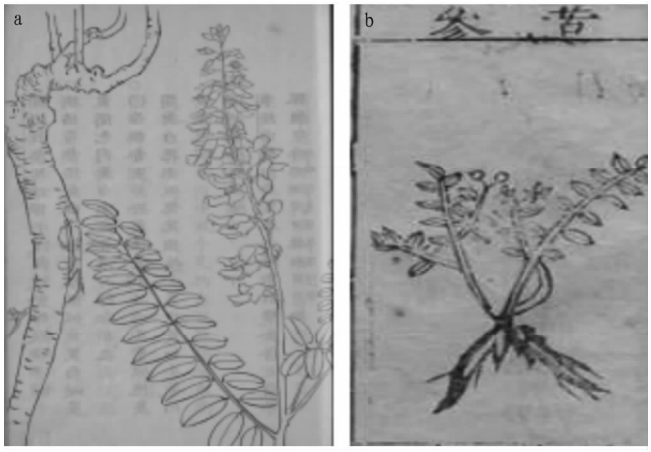
Historical Evolution of *S. flavescens* in Japan

Evolution of the original plant of *S. flavescens*

S. flavescens is called "クジン" in Japanese (katakana for *S. flavescens* in Japanese kanji) and "クララ" (describing the feeling of bitter taste when chewing in Japanese). *Tujie Benzao* (*Illustrated Materia Medica*)[21], published in 1680, gave a detailed description of the nicknames and plant morphology of *S. flavescens*: Kushi, Kugu, Dihuai, Shuihuai, Tuhuai, Jiaohuai, Yehuai, Baijing, Cenjing, Lubai, and Linglang; the plant is three or four feet high, and has small and green leaves, which are very similar to *S. japonica*. The leaves grow in spring and wither in winter, and are yellow and white. In July and August, the plant bears pods like radish, and the pods contain three seeds that are as strong as beans. Its roots are yellow, 5 to 7 cun long, two fingers thick, and three or five stems grow together. It is basically the same as the record of *S. flavescens* in *Bencao Tujing* compiled by Su Song in the Song Dynasty. It can be seen that the varieties of *S. flavescens* used in Japan were the same as those in China at that time, and the morphological description of *S. flavescens* was

followed by China at that time. In 1726, there was a description of *S. flavescens* flowers in *Yongyao Xuzhi* (Instructions for Medication)[22]: *S. flavescens* has yellow flowers like bean flowers, and bears pods. It shows that *S. flavescens* flowers are similar to bean flowers, which is also consistent with the previous record that *S. flavescens* is similar to *S. japonica* trees. It can be clarified that the medicinal *S. flavescens* used in Japan at that time was close to leguminous plants in plant morphology and flower morphology. Later, in 1772, the Japanese herbal book *Bencao Bianming*[23] recorded: *S. flavescens* is bitter and cold, and named Baijing, Kugu, and Shuihuai. It can be seen that the record of *S. flavescens* plants at that time was that *S. flavescens* is bitter and cold in nature, and shaped like *S. japonica*. There is no difference from the original records of *S. flavescens* in Japanese herbal books before, and it is similar to the description records of *S. flavescens* in China at the same time. In 1778, *Qianjin Yaofang Zhu*[24]: *S. flavescens* bears pods in June. It shows that *S. flavescens* bears seeds in June, and the seeds are accommodated in pods, which is close to the description in *Bencao Tujing* of the Song Dynasty[11] that "*S. flavescens* bears fruits in July, and the seeds look like small beans". The description in *Classified Materia Medica*[25] that the seeds are contained in pods is basically the same. In 1824, *Wohan Sancai Tuhui*[26] summarized the herbal records of *S. flavescens* in China before, and made it clear that Japanese medicinal *S. flavescens* had the same morphology as China at that time in *Compendium of Materia Medica*: *S. flavescens* grows in valleys and fields, and its roots are yellow, 5 to 7 cun long, two fingers thick, and three or five stems grow together. The seedlings are three or four feet high; there are many green leaves, very similar to *S. japonica*. The leaves grow in spring and wither in winter; and *S. japonica* has yellow and white flowers, and bears pods like radish in July and August, and the pod accommodated three seeds like beans, which are hard, and some seeds are streaky. According to the shape of *S. flavescens*, it was the same as China. In 1840, *Gufang Yaopin Kao*[27] recorded that: The only species of *S. flavescens* produced in the state shows roots which are similar to *Astragalus membranaceus*, hard-skinned, yellowish-brown outside, yellow and white inside, and extremely bitter in taste, and it is found in all mountains and plains. *S. flavescens* shoots in spring on the perennial roots, shows leaves like *S. japonica* and yellow and white flowers which bloom in summer, and bears small pods. The roots are as long as burdock and yellow and red. It can be seen here that the original plants of *S. flavescens* are also widely distributed in Japan: they are all found in mountains and plains, and shaped like *S. japonica*, and the flowers are yellow and white and bear pods, the roots are long and yellow. According to these descriptions, it can be seen that the medicinal *S. flavescens* in Japan at that time was similar to previous descriptions, and there is no significant difference in its morphology from modern medicinal *S. flavescens* (Fig. 1). The source of *S. flavescens* stipulated in the 17th edition of *The Japanese Pharmacopoeia* is the same as that in *Chinese Pharmacopoeia*, and it stated that its medicinal site is often the roots with the abscission of periderm[28].

According to the textual research of the above Japanese ancient books, it can be seen that although *S. flavescens* is also common in Japan, its efficacy and application are greatly influenced by China doctors. In 1810, it was also recorded in *Riyong Yaopin Kao*[29]: *S. flavescens*: imported, and true mostly in Japanese medicine shops. It can be seen that *S. flavescens* was introduced to Japan from China as an imported herbal medicine. Drawing lessons from and integrating the contents of China's materia medica, medicinal *S. flavescens* in Japanese history was consistent with traditional medicinal *S. flavescens* in China.



a. *Gufang Yaopin Kao*; b. *Compendium of Materia Medica*.

Fig. 1 Drawings of *S. flavescens* in Chinese and Japanese herbal classics

Evolution and changes of efficacy of *S. flavescens*

Japan first recorded in *Yunzhen Yehua* in 1507[30] that *S. flavescens* is mainly used for treating jaundice, abdominal qi stagnation and killing parasites, scabies, bloody diarrhea, and heat dysentery, and using *S. flavescens* to eliminate water dampness can nourish liver and gallbladder qi, dredge the nine important acupoints of the human body, quench thirst, dispel the effects of alcohol, and treat strong wind and hot rashes, needless to say mild wind. The medical efficacy of *S. flavescens* here mainly included treating jaundice, killing parasites and healing sores, nourishing liver and gallbladder, expelling wind and quenching thirst. Compared with the records of medicinal effects of *S. flavescens* in China's herbal books, the effects of *S. flavescens* in treating jaundice, dysentery, nourishing liver and benefiting gallbladder are consistent, and the effect of sobering up was also recorded in *Supplementary Records of Famous Physicians* in the Han Dynasty. Later, in 1698, *Heyu Bencao Gangmu* made a summary, including the medicinal effects of *S. flavescens* and various prescriptions. *Tujie Benzao*[31]: *S. flavescens* is mainly used for treating abdominal qi stagnation, abdominal mass accompanied by abdominal distension and abdominal pain, jaundice, intestinal wind, dry mouth and thirst, and feeling of uncleanness after urine, and using *S. flavescens* to eliminate water dampness can eliminate swelling, make eyes see things clearly and stop crying, and it can kill parasites, treat strong wind and all wind-heat rash. The efficacy of

S. flavescens in improving eyesight and stopping tears was supplemented here. Later, in 1772, *Bencao Bianming*[23] also recorded the hangover-relieving effect of *S. flavescens*: *S. flavescens* has the effects of benefiting the liver and gallbladder, nourishing the five internal organs, calming the nine important acupoints, promoting fluid production to quench thirst, improving eyesight and stopping tears, and is used for dysentery due to febrile diseases, red urine due to intestinal wind, jaundice, alcohol toxicity, dampness caused by hot air and worms. It can dispel wind, eliminate water, kill parasites, and treat scabies caused by strong wind. In 1840, *Gufang Yaopin Kao*[27]: *S. flavescens* can clear away heat, remove annoyance and relieve suffocation, and *Benjing* said: *S. flavescens* tastes bitter and cold, and is mainly used for treating abdominal qi stagnation, abdominal mass accompanied by abdominal distension and abdominal pain, and jaundice. *Bielu* said: *S. flavescens* has the effects of nourishing liver and gallbladder qi, protecting five organs, stabilizing the mind, replenishing the essence of the human body, dredging the nine important acupoints of the human body, eliminating latent heat, and treating spouting bleeding from anus. Here, the records of *S. flavescens* in *Shen Nong's Herbal Classic* and *Supplementary Records of Famous Physicians were repeated.*

According to textual research, it can be seen that the effects of *S. flavescens* in expelling water to kill parasites, removing heat to quench thirst, nourishing liver and benefiting qi, improving eyesight and stopping tears has been recorded in the history of Chinese and Japanese medication. Japan basically followed the records of *S. flavescens* efficacy in ancient books in China, and mainly emphasized that *S. flavescens* is bitter and cold, so it has the effect of expelling dampness to remove fever. For example, *Gufang Yaopin Kao*[27] recorded that: *S. flavescens* is extremely bitter and cool, so it can remove the heat and open Pimu, and thus relieve dysphoria with smothery sensation.

Evolution and changes of processing methods of *S. flavescens*

It was recorded in *Tujie Bencao*[21] that the roots are soaked in glutinous rice water for one night, and their fishy smell floats on the water, so the roots must be washed for several times and steamed, and then taken out for exposure and cutting. It is similar to the method recorded in *Leigong Paozhi Lun* in the Song Dynasty of China. In 1702, *Paozhi Quanshu*[31] recorded that: *S. flavescens* is bitter and cold. It is soaked in glutinous rice water for one night, and its fishy smell floats on the water, so it must be washed for several times, and then evaporated to dryness. It is less used in decoction, and more prepared into pills for treating sores. It can be soaked in wine for treating sores and stir-fried until smoke appears to cure intestinal wind. Here, the original method of sun-drying *S. flavescens* was changed to steaming, and different processing methods used for different diseases were described respectively. In 1778, *Qianjin Yaofang Zhu*[24] recorded that: The roots are dried in the shade and burned on the fire for wind, and are smoked and decocted for treating sores by washing. Here, it was expounded that when for expelling wind, *S. flavescens* was dried in the shade and burned; and to cure sores, the roots were smoked and boiled, and the usage was washing.

It can be seen that the processing methods of *S. flavescens* in ancient China and Japan were the same in the early stage, but after 1702, the descriptions of different processing methods of different prescriptions were added.

Summary

S. flavescens is an imported product in Japan, and *Wohan Sanchao Tuhui* also clearly showed that the shape of *S. flavescens* for daily use at that time was consistent with that of China, and there were also a record that it was true mostly in Japanese medicine shops. There is no great change in the records of the original plant, and there are descriptions of plant morphology including plant shape similar to *S. japonica*, yellow and white flowers and pods, and those of flowers and fruits. As for the medical efficacy of *S. flavescens*, the medical records in China in past dynasties mainly focused on the efficacy of treating jaundice, clearing away heat and toxic materials, killing parasites and healing sores, while Japanese works mainly summarized and described the efficacy records in China. In terms of processing, after the Song Dynasty, the methods recorded in the two countries were basically similar to those recorded in Leigong Paozhi Lun. Japan changed exposure to dryness to evaporation to dryness in *Paozhi Quanshu*, and meanwhile, there are records of different processing methods for prescriptions of different diseases. There are also records of different processing methods for prescriptions in China. However, whether there are differences in dosage forms for different diseases is worth further exploring.

References

[1] Chinese Pharmacopoeia Commission. Chinese pharmacopoeia[M]. Beijing: China Medical Science Press, 2015. (in Chinese).

[2] ZHOU JC, WU JY. Heat-clearing and dampness-drying *Sophora flavescens*[J]. Capital Medicine, 2014, 21(23): 43. (in Chinese).

[3] HAN YM, HAN GJ. Study on the parasite-killing effect of *Sophora flavescens*[J]. Anhui Agricultural Science Bulletin, 2016, 22(19): 67-68. (in Chinese).

[4] QIAN LW, DAI WH, ZHOU GQ, *et al.* Study on analgesic and anti-inflammatory effects of main alkaloids from *Sophora flavescens* and *Euchresta japonica*[J]. Chinese Traditional Patent Medicine, 2012, 34(8): 1593-1596. (in Chinese).

[5] LIANG R. Historical enlightenment of the rise and fall of Chinese medicine in Japan[J]. International Journal of Traditional Chinese Medicine, 2006(2): 72-75. (in Chinese).

[6] CHEN BB, CHEN Y. Comparison of the development of traditional Chinese medicine in China and Japan[J]. Cardiovascular Disease Journal Of integrated traditional Chinese and Western Medicine, 2017, 5(35): 7-9. (in Chinese).

[7] HU Q, TANG J. The enlightenment of the development of traditional Chinese medicine in Japan to Chinese traditional medicine industry[J]. Guide of China Medicine, 2011, 9(15): 337-338. (in Chinese).

[8] SHANG ZJ. Shen Nong's herbal classic[M]. Beijing: Academy Press, 2008. (in Chinese).

[9] TAO HJ. Supplementary records of famous physicians[M]. Beijing: People's Medical Publishing House, 1986. (in Chinese).

[10] BAO YH. Textual research on Wei Zhoufei's biography of sages of the past in Runan in Three Kingdoms[J]. Journal of Huzhou Teachers College, 2019, 41(7): 73-80. (in Chinese).

[11] SU S. Bencao Tujing (Illustrated classic of materia medica)[M]. Beijing: People's Medical Publishing House, 2011. (in Chinese).

[12] Jiangsu New Medical College. Great dictionary of Chinese materia medica[M]. Shanghai: Shanghai Scientific and Technical Publishers, 1979. (in Chinese).
[13] Editorial Board of Chinese Materia Medica, State Administration of Traditional Chinese Medicine. Chinese materia medica[M]. Guiyang: Guizhou Science and Technology Publishing House, 2005. (in Chinese).
[14] Editorial Board of Flora of China, Chinese Academy of Sciences. Flora of China[M]. Beijing: Science Press, 1994. (in Chinese).
[15] SU J. Newly revised materia medica[M]. Hefei: Anhui Science & Technology Press, 1981. (in Chinese).
[16] RIHUAZI. Rihuazi materia medica[M]. Hefei: Anhui Science & Technology Press, 2005. (in Chinese).
[17] LEI X. Leigong Paozhi Lun[M]. Hefei: Anhui Science & Technology Press, 1991. (in Chinese).
[18] LIU M. Determination of matrine content in Qingre Tonglin Tablets by HPLC[J]. Chinese Medicine Modern Distance Education of China, 2010, 8(2):159. (in Chinese).
[19] LI SS. Application and observation of Compound Huangbai Kushen Lotion in the treatment of vaginitis[J]. Clinical Research, 2019, 27(7): 130 - 131. (in Chinese).
[20] WU L, DAI GL, WANG Q, *et al.* Pharmacokinetic pharmacodynamic correlation study of oxymatrine in Qingre Yangxin Granules in mice with viral myocarditis[J]. Pharmaceutical and Clinical Research, 2017, 25(5): 377 - 381. (in Chinese).
[21] XIAJIN YUANZHI. Tujie Bencai[M]. Kyoto: Tianzhong Libing Wei, 1685. (in Japanese).
[22] SONGGANGXUANDA. Yongyao Xuzhi[M]. Osaka: Hanfang Wenxian Kanxinghui, 1972. (in Japanese).
[23] LIN ZL. *Bencao Bianming*[M]. Osaka: Jiwenziwu Shibingshu, 1772. (in Japanese).
[24] SONGGANG DIAN. *Qianjin Yaofang Zhu*[M]. Heiankyo: Yetian Tengba, 1778. (in Japanese).
[25] TANG SW. Classified materia medica[M]. Beijing: Huaxia Publishing House, 1993. (in Chinese).
[26] SIDAO LIANGAN. *Wohan Sancai Tuhui*[M]. Osaka: Qiutianwu Taiyou Yamen, 1824. (in Japanese).
[27] NEITENG SHANGXIAN. Gufang Yaopin Kao[M]. Tokyo: National Congress Library, Japan, 1843. (in Japanese).
[28] Committee of The Japanese Pharmacopoeia. The Japanese pharmacopoeia [S]. Tokyo: The Ministry of Health, Labor, and Welfare, 2016: 1782. (in Japanese).
[29] CHAITIAN ZHENGJIAN. Riyong Yaopin Kao[M]. Owari: Yonglewu Dongsilang, 1811. (in Japanese).
[30] MANASE DOSAN. Yunzhen Yehua[M]. Tokyo: National Congress Library, Japan 1843. (in Japanese).
[31] DAOSHENG XUANYI. Paozhi Quanshu[M]. Heiankyo: Dahewu Zuoyamen, 1702. (in Japanese).

Editor: Yingzhi GUANG Proofreader: Xinxiu ZHU

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[7] ZHANG CJ, REN YY, CAO LJ, *et al.* characteristics of dry-wet climate change in china during the past 60 years and its trends projection [J]. Climate Change Research Letters, 2021, 10(6): 728 - 741. (in Chinese).
[8] ZHANG YZ, ZHANG B, LIU YY, *et al.* Spatiotemporal variation of dry-wet climate from 1961 to 2013 in Loess Plateau Region[J]. Journal of China Agricultural Resources and Regional Planning, 2019, 40(6): 2 - 7. (in Chinese).
[9] CAO LJ, SUN HL, LAN XL, *et al.* Temporal and spatial evolution characteristics of extreme drought/wet events in Tianshan Mountains, Xinjiang[J]. Arid Zone Research, 2021, 38(1): 188 - 197. (in Chinese).
[10] ZHENG R, LI DL. Decadal changes of the wet and dry climate zone boundaries in the Qinghai - Tibet Plateau during 1971 - 2011[J]. Journal of Desert Research, 2016, 36(4): 1107 - 1115. (in Chinese).
[11] DU J, BIAN D, HU J, *et al.* Responses of climatic change on surface humid index in Northern Tibet during the period of 1961 - 2006[J]. Acta Ecologica Sinica, 2009, 29(5): 2438 - 2444. (in Chinese).
[12] DU J, HU J, CHEN H, *et al.* Trend of surface humid index in the middle reaches of the Yarlung Zangbo River over Tibet in recent 40 years[J]. Journal of Natural Resources, 2006(2): 196 - 203. (in Chinese).
[13] SHI JQ, DOU YL, YANG FY, *et al.* Temporal and spatial pattern characteristics of potential evapotranspiration in Tibet and its influencing factors[J]. Arid Zone Research, 2015, 38(3): 724 - 732. (in Chinese).
[14] DUAN YN, JI X, GUO RY. Analysis on the sensitivity and dominant meteorological factors identification of potential evapotranspiration variation in Yarlung Zangbo River Basin[J]. Research of Soil and Water Conservation, 2020, 27(2): 261 - 268. (in Chinese).
[15] QIAO L, WANG WK, MA ZT. Sensitivity of meteorological factors to potential evapotranspiration in Lhasa River Basin[J]. South-to-North Water Transfers and Water Science & Technology), 2020, 18(4): 97 - 103. (in Chinese).
[16] YANG SK, LIU J, ZHANG T. Characteristics of spatio-temporal variations of surface aridity index and its response to meteorological factors in the upper reaches of the Yangtze River[J]. Journal of Water Resources and Water Engineering, 2021, 32(4): 101 - 108. (in Chinese).
[17] ZHANG CJ, ZHANG JQ, HU ZH, *et al.* Study on drought monitoring, early warning and disaster risk assessment technology[M]. Beijing: China Meteorological Press, 2020: 205 - 209. (in Chinese).
[18] ZHANG B, CAO H, WU ZP, *et al.* Analysis on the status of dry-wet climate and the influence factors in Guizhou[J]. Meteorological and Environmental Sciences, 2021, 44(3): 39 - 46. (in Chinese).
[19] LIU J, CHEN TT, CHI DC. Rainfall trend analysis of the northwest liaoning province based on Daniel and Mann-Kendall Test[J]. Journal of Shenyang Aricultural University, 2014, 45(5): 599 - 603. (in Chinese).
[20] CHEN HS. Analysis and prediction of precipitation characteristics in Anhui Province based on wavelet analysis[D]. Hefei: HeFei University of Technology, 2019. (in Chinese).
[21] LI HY, XUE Y, CAO D, *et al.* Temporal and spatial variation characteristics of water profit and loss in Wulanchabu City in recent 50 years [J]. Journal of Arid Land Resources and Environment, 2019, 33(12): 145 - 155. (in Chinese).
[22] SHABITI, MAIMAITI, HUANKEXI, *et al.* Climate feature and dry-wet area change in Urumqi Region of Xinjiang during 1961 - 2014[J]. Arid Meteorology, 2016, 34(3): 448 - 455. (in Chinese).
[23] ZHAO XM, LI DL. Assessing meteorological conditions concerning icing in Southwest China based on GIS[J]. Journal of Glaciology and Geocryology, 2012, 34(3): 547 - 554. (in Chinese).
[24] QIN DH, ZHAI PM. Evolution of climate and ecological environment in China: 2021 (volume II, regional impact, vulnerability and adaptation) [M]. Beijing: Science Press, 2021. (in Chinese).

Editor: Yingzhi GUANG Proofreader: Xinxiu ZHU