HERBAL IDENTIFICATION

The Clinical Implications of an Ancient Art



Eric Brand

INTRODUCTION

The art of identifying genuine, high-quality medicinal materials has been a concern of Chinese herbal medicine practitioners for thousands of years. The herbs used in Chinese medicine have long been traded across vast geographic distances, and challenges related to adulteration have plagued practitioners since ancient times. Consequently, the field of herbal pharmacy has gradually accumulated a sophisticated range of organoleptic techniques to allow practitioners to differentiate herbal quality using traditional, experience-based methods. By gaining familiarity with commonly confused herbs and the basics of quality discernment, practitioners can maximize clinical efficacy and avoid problems related to misidentification and confusion.

In the modern era, the authentication of Chinese herbs draws on a number of approaches, including microscopy and chemical analysis in addition to traditional assessment based on gross morphological features. Prior to the 20th century, the identification and quality assessment of Chinese herbs was primarily achieved through observation using the naked senses, relying on appearance, aroma, taste, texture, and testing methods using water and fire. By the early 20th century, the modern scientific discipline of pharmacognosy arrived in China, and Chinese medicinal plants began to be systematically classified based on Latin taxonomy for the first time. Technological advancements such as microscopy, chemical testing, and genetic testing have further advanced authentication and quality control in modern Chinese medicine, yet traditional macroscopic identification using the naked senses remains as an essential, practical method that can resolve many key issues in daily clinical practice.

An Overview of Macroscopic Identification

Macroscopic identification has a long history of application in Chinese medicine. Methods of using fire and water testing to determine the authenticity of medicinals such as qin pi (Fraxini Cortex) and zhu sha (Cinnabaris) were described as early as the Han dynasty, and many traditional technical terms have gradually arisen to describe key macroscopic features for identification. Adulteration of herbal products has been a concern for centuries; for example, in the 6th century A.D., the physician Tao Hongjing summarized the challenges of the ancient herbal marketplace in the following timeless quote: "Many doctors do not recognize medicinals, and only listen to the vendors; the vendors are not experts and trust those that collect and distribute [medicines]. Those who collect and distribute rely on inherited [knowledge] and cannot distinguish genuine vs. inauthentic, good vs. bad."

Over the centuries, many materia medica texts discussed issues related to authenticity and quality discernment. Detailed color illustrations of plants were used to complement textual descriptions in ancient texts such as the Newly Revised Materia Medica (Xin Xiu Ben Cao), which was commissioned by the Tang Imperial court in 659 AD. In the Song dynasty around 1116 AD, an expert in medicinal identification named Kou Zong-Shi wrote the Extension of the Materia Medica (Ben Cao Yan Yi), which was one of the first printed texts to focus on the differentiation of genuine vs. inauthentic medicinals. By the Ming dynasty, an illustrated text called Origins of the Materia Medica (Ben Cao Yuan Shi) became the first text to feature identifying images of the medicinal,

materials rather than live plants, and modern texts with photo illustrations such as Chinese Medicinal Identification: An Illustrated Approach continue to bring this rich tradition into the 21st century. 7

Traditional macroscopic identification relies heavily on visual assessment, and many commonly confused herbs can be readily differentiated from one another based on appearance. For example, the herb ji xue teng (Spatholobi Caulis) is often confused with da xue teng (Sargentodoxae Caulis) because both herbs are vine products that are characterized by red striations on their cut surface. However, ji xue teng features round, deep red striations that do not intersect, while da xue teng has red striations that converge in the center like spokes on a bicycle wheel. These two herbs have significantly different clinical effects but they are widely confused in the marketplace; however, they can be easily distinguished visually once one knows what to look for.



Above. Da xue teng (Sargentodoxae caulis)
Below. Ji xue teng (Spatholobi Caulis)

Beyond determining identity, visual assessment of medicinal materials can also provide important clues into the quality and geographic origin of herbal products. Since macroscopic features are widely used to assess the quality of Chinese herbal products in trade, customary methods of cutting and presenting herbs often emphasize particular macroscopic features. For example, huang lian (Coptis Rhizoma) is often cut longitudinally to reveal an intricate pattern of deep yellow lines on the cut surface; the intensity of the yellow color seen on its cut surface is directly related to its quality and berberine content.

Differences in processing methods are also often associated with changes in color. For example, unprocessed ginseng has a yellowish-white color, while steam-processed ginseng is red inside and out. While the method of steam-processing to produce red ginseng was originally devised centuries ago as a method of preventing insect damage, today white ginseng is considered to be better for boosting body fluids while red ginseng is thought to be warmer and stronger for supplementing qi. In Japan, ginseng is often processed by par-boiling, which causes it be yellowish-white on the outside and red on the inside; this form, called dong yang shen, is thought to have a relatively moderate qi-supplementing effect without the tendency to produce heat.

Visual assessment can also provide clues about the growing region, age, or wild vs. cultivated nature of herbal materials. For example, gou qi zi (Lycii Fructus) grown in Ningxia province has pointed ends, a firm texture, and a slightly bitter taste, while that grown in Xinjiang province is more round, soft, and sweet. In the case of hou po (Magnoliae Officinalis Cortex), visual assessment can reveal the difference between trunk bark, root bark, and branch bark, and upon close inspection small “silver stars” can be seen in high-quality specimens (reflecting the educts of its key chemical constituents). Similarly, in the context of ginseng, experience in visual assessment can reveal extensive information about the age, growing environment, and overall quality of a given specimen.

In addition to visual clues, taste and aroma are extremely important in assessing medicinal quality. Many herbs have a distinctive aroma, the vibrancy of which is often indicative of their quality and freshness. For example, the quality of xin yi hua (Magnoliae Flos) can be assessed by peeling off its fuzzy outer layers until a small, hard conical core remains; when the core is crushed, it reveals a potent aroma of volatile oils that can be used as a rough gauge of freshness and quality. Likewise, the flavor of many herbs reflects their chemical constituents and is often closely correlated with quality. Many sour herbs such as shan zha (Crataegi Fructus) contain organic acids, while many sweet herbs such as dang shen (Codonopsis Radix) are rich in polysaccharides.

In addition to assessing the appearance, taste, and smell of medicinal materials, observing their texture and

fractured surface is an important aspect of macroscopic identification. For example, the safe herb han fang ji (Stephaniae Tetrandrae Radix) is prone to confusion with the toxic herb guang fang ji (Aristolochiae Fangchi Radix) due to similarity in their Chinese names. While the two herbs have a similar appearance, the former is characterized by sparse, faint striations while the latter has dense, dark striations that appear like spokes on a wheel; when the material is broken, the safe herb han fang ji is very powdery while the aristolochic acid-containing adulterant guang fang ji is comparatively coarse. Due to its powdery texture, han fang ji is also called fen fang ji, "powdery fangji."

Traditional macroscopic identification also emphasizes testing with water and fire, which can provide important clues about the identity of some medicinals. For example, the color and characteristics of the smoke emitted after burning qing dai (Indigo Naturalis) or ru xiang (Olibanum) can provide insight into their purity. Hai jin sha (Lygodii Spora), which consists of nondescript brown spores from a particular fern, creates a bright flash and an explosive sound when it is sprinkled on a flame. When soaked in water, qin pi (Fraxini Cortex) produces a fluorescent blue color when exposed to sunlight. In another example, genuine saffron (fan hong hua) can also be distinguished from ordinary hong hua (Carthamus Flos) by observing the way that their yellow color diffuses into a vial of water.

Avoiding Common Adulterants

In China, the clinical practice of Chinese medicine is a separate discipline from herbal pharmacy, and clinicians are able to rely on experts in pharmacy to obtain the correct medicinals for use. By contrast, practitioners in the West often have to play the role of both doctor and pharmacist, which requires a relatively sophisticated understanding of multiple disciplines. While mastery of the subtle nuances of herbal pharmacy is unrealistic for most clinically-focused practitioners, it essential for all practitioners to know how to avoid potentially dangerous substitutes, and to make sure that the items prescribed have been correctly identified so that reliable therapeutic results can be achieved.

Issues of confusion and adulteration with Chinese herbs are often unintentional, resulting from similarities in Chinese names, similarities in appearance, or the use of substitutes common in regional trade. While intentional adulteration is also an issue, it tends to be associated with products of high economic value and often involves simple misrepresentation, such as the practice of selling woods-grown cultivated ginseng at an inflated price to a buyer who believes that it is true wild ginseng.

It is estimated that about 26% of the Chinese herbs in global trade pass through Hong Kong, and the market situation in Hong Kong is largely mirrored in the overseas markets for Chinese herbs. Consequently, certain herbs that are regionally confused in Hong Kong tend to also be confused overseas. In most cases, with the proper training these commonly confused herbs can be easily distinguished from one another based on their appearance.

Regional Substitutes

While the official botanical identity of Chinese herbs is established by the Chinese Pharmacopoeia, some herbs have a long history of use as substitutes in certain geographic regions. Additionally, there are differences in the identity of certain herbs between the official pharmacopoeias of Japan, China, and Korea. For example, the Japanese, Chinese, and Korean Pharmacopoeias list different species of source plants as the official botanical origin of a number of commonly used herbs, including bai zhu, chuan xiong, chai hu, and dang gui.

In the West, the most commonly encountered regional substitutes tend to be substitutes that are commonly encountered in Southern China, due to Hong Kong's prominence in the distribution chain of Chinese herbal products. These items include:

Ban lan gen- Most practitioners associate the name Isatis Radix with ban lan gen, because Isatis tinctoria is the species officially listed in textbooks and the Chinese Pharmacopoeia. However, in practice it is extremely common to see the root and rhizome of Baphicacanthus cusia sold under the name ban lan gen. These two plants both have a long history of use as regional variations of the same herb, and they are now separated in the Chinese Pharmacopoeia with their own entries and their own names- isatis is called bei ban lan gen while baphicacanthus is called nan ban lan gen. Both herbs can be processed to create qing dai (Indigo Naturalis) and both are widely considered acceptable for clinical use, though they should be distinguished from one another in trade through clear nomenclature.

Jin qian cao- While the official form of jin qian cao is Lysimachia christinae, in the West it is often more common to see a regional variant of jin qian cao that is properly known as guang jin qian cao, which is derived

from Desmodium styracifolium. As with the two forms of ban lan gen described above, both forms of jin qian cao are regarded as effective and they are now separated as individual entries in the Chinese Pharmacopoeia.

Wang bu liu xing- As indicated by its Latin Pharmaceutical name, Vaccariae Semen, the correct item is a small black seed. It is commonly confused with a substitute made from the whole fruit of a plant in the fig family that is properly called bi li guo or guang dong wang bu liu xing (Receptaculum Fici Pumilae).

Sheng ma- The official form of sheng ma is derived from Cimicifuga heracleifolia, C. dahurica, and C. foetida (some botanical references have now reclassified these plants into the Actaea genus). However, in many Cantonese pharmacies, it is not uncommon to see a plant called Cantonese sheng ma (guang dong sheng ma, the root of Serratula chinensis) sold under the name sheng ma. The two can be easily differentiated visually because the cut surface of genuine sheng ma is heavily striated while the Cantonese substitute is comparatively smooth. According to materia medica texts, the Cantonese substitute is indicated for measles but it is not specifically ascribed with a yang-lifting action, so its properties only partially overlap with true sheng ma.

A number of other Chinese herbs are prone to confusion due to similarities in their Chinese names. For example, a processed form of the lateral root of aconite (fu zi) known as bai fu pian is easily confused with bai fu zi (Typhonii Rhizoma) due to their similar nomenclature.

The herb he huan hua (Albizziae Flos) is confused with the flower of Magnolia cocos, which is called ye he huan in Chinese. Similarly, chuan niu xi (Cyathulae Radix) is easily confused with wei niu xi (derived from Strobilanthes forrestii).

In some cases, a given herb may have multiple plants that appear as substitutes on the market. For example, bai tou weng (Pulsatillae Radix) and zi cao (Arnebia/ Lithospermi Radix) are often confused with the herb wei ling cai (the whole herb of Potentilla chinensis), and the former is also confused with Polycarpaea corymbosa. In of all the cases described above, macroscopic identification is sufficient for proper differentiation.

While many substitute plants have a long history of apparently safe use, there a few examples of key safety concerns related to misidentified Chinese herbs.



Chuan niu xi
(Cyathulae radix)



Wei niu xi
(Strobilanthes forrestii)



Zi cao
(Arnebia radix)



Wei ling cai
(Potentilla chinensis)

Importantly, a number of plants that contain aristolochic acid have a history of confusion with safe, AA-free herbs. Of these, the cases of mu tong and fang ji are representative examples. Additional concerns with aristolochic acid relate to confusion regarding the correct plant part for the medicinal xi xin. Another example of a safety risk due to misidentification relates to the improper substitution of san qi (Notoginseng Radix) with a toxic herb called chuan san qi (Tupistra Rhizoma). Again, with the proper training, practitioners can easily avoid these substitutes by closely observing the appearance of the product.

The case of xi xin is an example of the importance of dispensing the correct plant part, as the aerial portion of xi xin contains aristolochic acid while the root and rhizome are considered safe for use. Historically, only the root and rhizome were used as xi xin, and ancient texts from the 6th century onward invariably noted that he used part should be the root and the aerial portion should be discarded. In the past, the whole plant was sold with the aerial portion and roots intact so that the leaves could be used by vendors for identification purposes, then the aerial portion was discarded and the root was dispensed in prescriptions. Then in the 1950s in mainland China, a shortage of medicinal material led vendors to begin mixing the aerial portion and roots together in commerce, and by the 1963 edition of the Chinese Pharmacopoeia, the root and whole herb was listed as the official identity of xi xin. By the 1990s, the risks of aristolochic acid became more widely recognized and the Chinese Pharmacopoeia ultimately changed the official identity of xi xin to return to its original state as only the root and rhizome. However, it has taken time for the market to fully correct itself, and the whole herb is still occasionally seen on the raw herb market despite the fact that only the root and rhizome is safe for use.

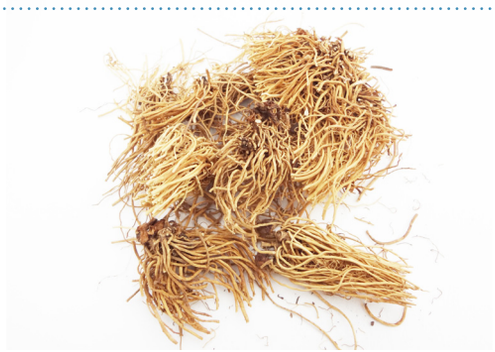
While a single article is not sufficient to adequately convey all the nuances of macroscopic identification and commonly confused herbs, abundant resources are available to practitioners seeking to deepen their knowledge in this area. Bilingual references for herbal identification such as the Hong Kong Chinese Materia Medica Standards are available for free online, and the library of Hong Kong Baptist University maintains a bilingual online database of medicinal plant images and medicinal material images that covers the identification of all major herbs in circulation. Additionally, an exceptional textbook on macroscopic identification by Prof. Zhao Zhongzhen and Prof. Chen Hubiao, titled



san qi
(Notoginseng Radix)



chuan san qi
(Tupistra Rhizoma)



Xi xin
(root and rhizome)



Xi xin
(aerial portions and roots together)

Chinese Medicinal Identification: An Illustrated Approach, was released by Paradigm Publications in 2014, covering 428 common medicinals with detailed color photos and descriptions that illustrate their key identifying characteristics.

As a discipline, Chinese medicinal authentication and the broader field of herbal pharmacy is still largely virgin territory that has remained minimally explored by Westerner practitioners. Consequently, there are abundant opportunities available for those with an academic or professional interest in Chinese herbal pharmacy, and there is a clear need to bring fresh knowledge to the clinical community in the West regarding topics such as herbal identification, quality discernment, natural resources, pao zhi processing, and ben cao literature. After all, the best diagnosis and theory will only carry the day if practitioners have access to authentic, high-quality herbs.

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