Farm to Pharmacy:
Herbal Quality and Natural Resources in Chinese Medicine

By Eric Brand, L.Ac.

The Sourcing and Supply Chain of Chinese Herbs

- Production Regions
  - Cultivated vs. Wild
  - Effect of growing region on quality (Xi Yang Shen)
- Wholesale Markets
  - Bozhou, Chengdu, Guangzhou, Anguo, etc.
    - Bozhou is home to 1.3 million people and covers 2,226 square kilometers.
    - Over 6,000 tons of herbs arrive every day, and 30,000-40,000 daily visitors come to shop.
    - Over 6,000 merchants, annual trade is estimated at 10 billion Yuan.
- Importers
  - Western supply chain is influenced by the Southern trading route through Hong Kong
  - Best herbs go to Japan, Korea, Hong Kong, Taiwan, Singapore, USA (in descending order)
  - Subject to errors from the use of Cantonese substitutes
- Distributors
  - To practitioners and OTC market

Herbal Wholesale Markets

- Dihuajie in Taiwan (left)
- Qingping in Guangzhou (right)

Production Regions

- By species, about 70% of the Chinese herbs in the C.P. are wildcrafted and 30% are cultivated
- By weight, about 50% is cultivated
- Over 1200 different herbal products can be found on the Chinese domestic market
- About 150 herbs are primarily obtained from cultivated sources, with an average combined production of about 300,000-350,000 metric tons.

A Geographical Map of Chinese Medicinal Plants

- Vast territory, diverse landforms, mountain ranges, climates, and abundant medicinal resources.
- Over 1,000 species of medicinal plants, mostly wild, with a relatively rich deposits.

Panax ginseng C. A. Mey

A: Northeastern cold temperate zone

Over 1,000 species of medicinal plants, mostly wild, with a relatively rich deposits.
Dioscorea opposita Thunb.

There are about 1,000-1,500 species of cultivated and/or wild medicinal plants.

B: Northern warm temperate zone

Paeonia lactiflora Pall.

More than 3,000 species of cultivated and/or wild medicinal plants.

C: Central subtropical zone

Morinda officinalis How.

More than 4,500 species of medicinal plants. This is an area that assembles medicinal materials produced in southern China.

D: Southern subtropical zone

Pinellia ternata (Thunb.) Breit.

More than 5,000 species. Many reputed famous medicinal materials produced in Sichuan, Yunnan and Guizhou provinces are from this zone.

E: Southwestern subtropical zone

Lycium barbarum L.

More than 2,000 species of medicinal plants with a rich deposit of wild species but an uneven distribution.

F: Northwestern arid zone

Rheum palmatum L.

More than 1,000 species, mostly wild.

G: Qinghai-Tibet plateau zone
**Dao Di Yao Cai**
**Authentic [region] Medicinals**
- Premium quality huáng lián (Coptidis Rhizoma), chuán xiong (Chuanxiong Rhizoma), and fù zǐ (Aconiti Radix Lateralis Praeparata) all come from Sìchuan (in Western China).
- Premium quality chén pí (Citri Reticulatae Pericarpium) comes from Guangdong (in the South).
- Premium quality rén shēn (Ginseng Radix), xì xīn (Asari Radix), and wu wèi zǐ (Schisandrae Fructus) are from Manchuria (the North-East).
- Premium quality fú líng (Poria) is from Yúnnán (the South-West).
- Premium quality dì huáng (Rehmanniae Radix) comes from Hénán.
- Premium quality e jiao (Asini Corii Colla) comes from Shandong.

**Regional Specialties**
- A few major examples of regional specialties include:
  - Manchuria- Lu Rong, Ren Shen, Xi Xin
  - North- Huang Qi, Dāng Guì
  - Henan- Grows over 300 medicinals, famous for Huai Niu Xi, Huai Shan Yao, Dí Huáng
  - Guizhou- Tian Ma, Du Zhong, Wu Zhu Yu
  - Silk road- Qin Jiao, Gan Cao, Zì Cao, Rou Cong Róng
  - Tibet- Zāng Hong Hua, Dōng Chóng Xia Cáo, Xue Lián Hua, Hóng Jing Tian

**Regional Map**
- This map shows the wild populations and cultivated production volume at the county level.
- Illustrated here are Shan Yao and Wu Wei Zì sites

**Wild vs. Cultivated Products**
- Dong Chóng Xia Cáo
- Xī Yang Shen
- Tíān Mǎ
- Ren Shēn
- Bái Shào vs. Chì Shào
- Shí Hú
- Bái Zhū
- HUáng Qí
Prior to the Song dynasty:
- Ginseng was found in a wide region that included Shanxi, Hebei, and provinces of north-east China
- Ginseng plants of the Araliaceae were growing in the Luzhou region in former times (the area is now known as Shanxi's Changzheng region).
- Miscellaneous Records of Famous Physicians (Ming yi bie lu) stated that Ginseng radix (ren shen) produced in Shanxi's Shangdang region was of high quality.

Qing dynasty:
- The daodi production region assigned to Ginseng radix (ren shen) had already moved to northeastern China.
- "Great Leap Forward" (1958-1959), people in mainland China attempted to cultivate ginseng on Hainan Island in southern China. However, the roots grown in Hainan were large but almost completely lacking in active constituents, ending up nearly useless beyond the appearance.

Overharvesting and environmental changes have resulted in a number of changes in terms of varieties, growing regions, and natural resources for some traditional medicinal materials.

Codonopsis (Dang Shen)
- Dang Shen entered Chinese medicine 1500 years after ginseng, in 1757 CE. It lacks ginseng's actions of supplementing the heart qi and quieting the spirit, as well as the actions of "yi zhi"- boosting mental faculties, and greatly supplementing original qi.
Fake Cordyceps

Cultivation techniques of Rehmannia

- Prior to the Song dynasty, traditional production areas include Shaanxi’s Xianyang, Tongzhou (陝西的咸陽、同州), Jiangsu’s Pengcheng and Jiangning (江蘇的彭城、江寧).

- From the Ming dynasty onward, it was generally recognized that cultivated in Huaiqingfu (Henan province) was of particularly high quality. “four famous medicinal materials of Henan”

- Li Shizhen (Ming Dynasty): “ancient people cultivated [Rehmanniae radix (di huang)] from seed, contemporary people cultivate it from roots. 古人種子,今為種根” The asexual cultivation method is used up to the present day.

Large, high-yielding roots with high levels of the active constituent catalpol

Good Agricultural Practice (GAP) for Traditional Chinese Medicinal Materials has been enforced by the Chinese government since 2002

This has expanded production regions for daodi medicinal materials and allowed new daodi medicinal materials to emerge.

Aucklandiae radix (mu xiang)

- originally produced in India and Myanmar
- historically called guang mu xiang because it was imported into China via Guangzhou.
- it was successfully cultivated in China’s Yunnan province (麗江, Yunnan) and produced good quality medicinal material known as yun mu xiang.
- the total amount of costunolide and dehydrocostuslactone contained in Aucklandiae radix (mu xiang) produced in Yunnan was much higher than that specified in the Chinese Pharmacopoeia.

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Crocus stigma (xi hong hua)

- was originally produced in Southern Europe, historically imported into China via Tibet.
- incorporated into Chinese medical practice in the Ming Dynasty, known as Croci stigma (xi hong hua), moves the blood, dissipates blood stasis, cools the blood, and resolves toxicity.
- nowadays, it has been successfully cultivated in Shanghai (GAP plantation sites), Jiangsu, and Zhejiang provinces in China.

It takes 160,000 flowers to produce a single kilogram of saffron.
American ginseng (*Panax quinquefolius* L.)

- In 1702, a French priest Father Jartoux observed the use of Chinese ginseng in Manchuria.
- Fascinated by his information, priest Father Joseph Francis Lafitau in North America (French Canada) discovered American ginseng near Montreal in 1716.
- Later on, American ginseng from Canada was brought to China and became a valued item in the imperial court.
- American ginseng is now successfully cultivated in China on a large scale. Certified GAP plantation sites have also been established in Jilin province.

**Jilin province, China**

**Wisconsin, USA**

**Ontario, Canada**

Chinese medicinal processing and *daodi* medicinal material

- Chinese medicinal processing (*paozhi*) is a pharmaceutical technique that meets different therapeutic, dispensing, and pharmaceutical requirements based on traditional Chinese medicine (TCM) theory.
- Medicinal processing scene and equipment in *Concis Addendum to Grandfather Lei’s Treatise on Herbal Processing (Bu Yi Lei Gong Pao Zhi Bian Lian)* of the Ming dynasty.

**Traditional Chinese medicinal processing produces special characteristics of the *daodi* medicinal material**

Processed products of Aconiti lateralis radix praeparata (*fu zi*)

- *Aconiti lateralis radix praeparata* (*fu zi*) is processed into various products to reduce the toxicity and meet different therapeutic requirements.
- *Fuzi* (*aconite lateral root*) is processed into various products to reduce the toxicity and meet different therapeutic requirements.*

Creation of Asini corii colla (*e jiao*)

- In ancient times, Asini corii colla (*e jiao*) was made from ox hide.
- *Compendium of Materia Medica* (*Ben cao gang mu*) proclaimed *e jiao* from donkey hide to be a “sacred medicine.”
- From that point on, the item produced from ox hide became known as *huang ming jiao*, and that produced from donkey skin became known as *e jiao*.

**Chinese medicinal *e jiao* produced in Dong'e, Shandong province**

- An instruction detailing of *e jiao* in the *Daoguang* years of the Qing Dynasty (1821-1850 C.E.) describes the entire process of making *e jiao*.
- The instruction not only details the water used to make *e jiao* as well as the raising of the donkey and the selection of the hide, but also outlines a strict sequence of using silver pots and gold shovels.
- For a thousand years, *e jiao* was known as “nine dynasties tribute gelatin” because it achieved a great reputation due to its excellent clinical effect.

**Records of *daodi* medicinal in historical literature**

- The first text to discuss the importance of production region: *The Divine Husbandman’s Classic of Materia Medica* (*Shen nong ben cao jing*)
- Each medicinal material has laws for its production region, authenticity, and freshness.
- *土地所出,真偽新陳,並各有法*

**Eastern Han Dynasty**

**Northern and Southern Dynasties period**

**Tang dynasty**

**Song Dynasty**

**Ming Dynasty**

**Modern times**
Records of daodi medicinal in historical literature

Collection of Commentaries on the Classic of the Materia Medica
(Ben cao jing ji zhu)

- "the places where all medicinals come from have specific boundaries"

• started to record specific production regions for medicinals
• began to use terms such as "the best" (zui jia) and "surpasses" (wei sheng) to describe correlations between appearance, production region, and quality

Records of daodi medicinal in historical literature

Formulas Worth a Thousand Gold Pieces
(Qian jin fang)

- "Ancient doctors depended on medicinals produced from the proper production areas. Therefore, if they treated ten patients, they achieved results in nine. Although contemporary doctors understand the pulse and prescriptions, they are not familiar with the proper production regions, harvest time, and quality of medicinal materials. Therefore, they only achieve results in five or six cases out of ten."

Records of daodi medicinal in historical literature

Essentials of Materia Medica Distinctions
(Ben cao pin hui jing yao)

- 1809 medicinals and featured with 1371 illustrations
- The entry "daodi" was formally listed under the heading of "land" (di) for 268 botanical medicinals specifying their production regions

Records of daodi medicinal in historical literature

Famous masterpiece opera by Tang Xianzu
The Peony Pavilion: Exploration of Medicine
(《牡丹亭·詗藥》)

- "good daodi medicinal materials"
- the term "daodi medicinal material" spread far and wide among common people in China

Records of daodi medicinal in historical literature

Materia medica commissioned by the government:
Newly Revised Materia Medica
(Xin xiu ben cao)

- "if medicinal material is not produced from its native environment, the effect will be different."

Records of daodi medicinal in historical literature

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Mountain Ginseng

- True Wild
  - Ye Shan Shen (野山参)

- Half-Wild
  - Yi Shan Shen (移山参)
    - Transplanted to the wild environment
  - Lin Xia Shen (林下参)
    - Grown from seed in the wild

- Fakes
  - Gong Yi Shen (工艺参)

Differentiating Half-Wild Ginseng

- Transplanted roots vs. roots grown from seed

Fake Wild Ginseng

- The neck is built from broken heads, whole small roots, and superglue, attached to an average field-grown root

Examples of herbs that are almost exclusively cultivated

- **Dang Gui**: Gansu province is the principle growing region of Dang Gui, producing over 90% of the Chinese domestic supply. The importance of Dang Gui over the history of Chinese medicine is summed up in the phrase “10 formulas, 9 angelicas.” It is estimated that the annual consumption of Dang Gui is about 12 million kilograms.

- **Ren Shen**: With the exception of ginseng grown in Japan, Korea or Russia, Asian ginseng is exclusively produced in China’s three Northeastern provinces: Jilin, Heilongjiang, and Liaoning. Jilin produces about 70% of the total. Ginseng has been cultivated for over 400 years, and the total amount that is consumed annually is estimated at 6-7 million kilograms.

- **Bai Zhi**: Bai Zhi is entirely cultivated, with Sichuan Bai Zhi accounting for about 70% of the total volume. The cultivation of Bai Zhi has been documented for over 600 years.

- **Huang Lian**: has also been cultivated for over 600 years, and virtually the entire supply is cultivated at present. About 1.5-1.8 million kilograms are used per year.

- **Dang Shen**: Until the 1950s, nearly all the Dang Shen in use was wild. Now the wild populations are depleted and the cultivated product dominates the market. About 30 million kilograms per year are used.

- **Rehmannia**: has been cultivated for over 1000 years, and all the product on the market comes from cultivated sources. About 20 million kilos per year are used.
Bai Shao vs. Chi Shao

- All Bai Shao is cultivated and all Chi Shao is wild-harvested.
- The plant *Paeonia lactiflora* produces both Bai Shao and Chi Shao.
  - When it is cultivated and subjected to Pao Zhi (boiling and peeling the skin) it is Bai Shao
  - When it is wild and the skin is left intact it is Chi Shao.
- Bai Shao only comes from cultivated *P. lactiflora*, but Chi Shao can come from wild *P. lactiflora* or *P. veitchii*.
- *P. veitchii* is difficult to cultivate and is only prevalent in the wild.

Gou Teng GAP site
**Grading and Quality**

- Many medicinals are sorted based on size, aroma, luster, and other distinctive characteristics.
- The same field can produce multiple grades; grading is used to determine price.

**Common Shi Hu Substitute**
(You Gua Shi Hu, *Ephemerantha fimbriata* (Bl.) P.E. Hunt et Summ)

**Genuine Shi Hu**

**Chuan Bei Mu vs. Ping Bei Mu**
Chinese Red Ginseng Differentiated by Grade

Chinese White Ginseng (heavily sulfured)

Commonly Confused Items in Trade

- Over the centuries, many different regional substitutes and adulterants have been introduced into the herbal marketplace, and many herbs that have similar names and appearances are easily confused.
- To achieve reliable therapeutic results and avoid potentially harmful substitutes, it is essential for Chinese medical practitioners to use correctly identified herbal medicines.

Causes of Confusion

- Differences in the plant part used
  - Xi Xin
- Similarities in Chinese names
  - San Qi vs. Chuan San Qi, Bai Wei vs. Bai Wei Cao, Chuan Niu Xi vs. Wei Niu Xi
- Similarities in appearance
  - Bai Qian (hollow) vs. Bai Wei (solid)
  - Wei Ling Xian and Long Dan vs. Gui Jiu
  - Ping Bei Mu vs. Chuan Bei Mu
  - Ji Xue Teng vs. Da Xue Teng

Xi Xin (whole herb)
Xi Xin (root)

San Qi (notoginseng) vs. Chuan San Qi (tupistra)

Guang Fang Ji vs. Han Fang Ji

Cantonese Fu Ping (Da Fu Ping)

True Fu Ping

Wei Ling Cai (potentilla) Sold as Bai Tou Weng and Zi Cao
Da Xue Teng vs. Ji Xue Teng

Sheng Ma

Wei Niu Xi

True Chuan Niu Xi

Photos from Prof. Zhao Zhongzhen’s Easily Confused Chinese Medicines in Hong Kong

Acceptable Substitutes

- He Huan Hua
  - Cantonese substitute is a magnolia flower with similar TCM action to quiet the spirit, but lacks the qi-coursing action of the true product. Also more expensive than the official medicinal.

- Jin Qian Cao
  - Southern variant is often more common than the main medicinal, regarded as very effective

- Ban Lan Gen
  - Southern variant is often more common than the main medicinal, regarded as very effective

Unacceptable substitutes in terms of TCM action

- The following items have substitutes that differ in traditional therapeutic effect from the main medicinal, but the mistaken herbs are generally not regarded as being particularly dangerous.
  - In many cases, the substitute herb has not been studied extensively from a chemical and clinical perspective.
  - Fu Ping
  - Chuan Niu Xi
  - Bai Wei/ Bai Qian
  - Ji Xue Teng/ Hong Teng (Da Xue Teng)
  - Zi Cao
  - Bai Tou Weng
  - Sheng Ma
  - Wang Bu Liu Xing
Dangerous Substitutes

- **Fang Ji**
  - Must use han fang ji, also known as fen fang ji (stephania)
  - Rule out aristolochia root, known as guang fang ji

- **Mu Tong**
  - Self is panixus. Shou me mu tong, forma is common.
  - Alokia is also safe but is rare on the market.
  - Must rule out guan mu tong, Manchurian aristolochia, which contains aristolochic acid

- **Mu Xiang**
  - Standard mu xiang or chuan mu xiang are fine, not Qing Mu Xiang

- **San Qi**
  - Rule out Rhizoma Tupisra

- **Long Dan Cao**
  - Dangerous substitute is called gui jiu. Fortunately, it is uncommon.

- **Xi Xin**
  - Use roots, not aerial portions