ATRACYLODES
Baizhu and Cangzhu

SOURCES
Atractylodes refers mainly to Atractylodes macrocephala (macro = big; cephal = head; so, big-headed atractylodes) known in Chinese as baizhu. Less frequently used is A. lancea (lancea = lance-like, so lance-leaved atractylodes) or its less-desirable (somewhat weaker) substitutes, such as A. chinensis, A. japonicum, and A. ovata, known in Chinese as cangzhu (see plant photos below). The basic term zhu was the only one used when atractylodes was first recorded in the ancient Shennong Bencao Jing (ca. 100 A.D.); the division between these two related herb materials first occurred in the Mingyi Bielu (ca. 500 A.D.). At that time, the tuber-like rhizomes of these plants were specified as either baizhu (bai = white) and chizhu (chi = red), referring to the color observed in the sliced rhizomes, the red being due to spots of accumulated oils. Later, chizhu was renamed cangzhu (cang = gray or black), which refers to the appearance of the outer skin of the rhizome, a dark gray-black color.

The Shennong Bencao Jing (1) description is:

Zhu is bitter and warm. It mainly treats damp impediment, dead muscles, tetany, and jaundice. It stops sweating, eliminates heat, and disperses food. It can be used as a conductor in decoctions. Protracted taking may make the body light, prolong life, and make on free from hunger.

Today, the main functions still recognized for both baizhu and cangzhu are the ability to overcome moisture accumulation (damp impediment) and to promote digestion (disperse food). The statement about making the body feel light refers to the role of herbs as longevity tonics, and Taoist practices towards that aim that led to loss of body weight and appetite (usually from consuming heavy metals in alchemical mixtures). Dead muscles and tetany refer to paralysis of the muscles either by flaccidity (no ability to contract on will) or tonic paralysis (being in constant spasm). Jaundice indicates yellowing of the skin, which we know today is usually from hepatitis or biliary blockage; but, in traditional medicine, this was seen as a debility of the spleen, which is the organ of the earth element associated with the color yellow. Zhu would help stop sweating by diverting the fluid to urination and by strengthening the body to resist spontaneous sweating (a sign of weak qi unable to hold the pores closed). One of the indicators for using atractylodes in a diuretic formulation is that there is limited urinary elimination but excessive sweating. Although zhu is warm in nature, it was used to eliminate heat by purging dampness that carried out heat with it.

Zhu was a common ingredient in the Shanghan Lun and Jingu Yao-lue (ca. 220 A.D.) by Zhang
Zhong-jing (2, 3), and the ingredient used today for those formulas is baizhu. Its main application in those texts was to eliminate damp and it often appeared in formulas along with hoelen (fuling) for that purpose. An example is Ling Gui Zhu Gan Tang, made of the four herbs in the formula’s name (ling = hoelen; gui = cinnamon; zhu = atractylodes; gan = licorice). The formula is used for moisture accumulation that puts pressure on the chest area, with mild body edema, and limited urination. Another example is the well-known Wuling San (Hoelen Five Formula), which includes atractylodes and hoelen with alisma, polyporus, and cinnamon; to this day, it is the primary base formulation for treating moisture accumulation.

Comparison of baizhu and cangzhu is a matter that is of considerable concern to traditional medicine doctors because of the evident overlap of the two herbs historically and therapeutically. Dr. Jiao Shude summarizes (4):

cangzhu and baizhu both fortify the spleen and dry dampness. However, cangzhu is aromatic, bitter, and warm and has a dry and harsh nature. It upbears yang, dissipates depression, and dries dampness. It has a stronger upbearing and dissipating action than baizhu, but its ability to fortify the spleen, supplement qi, and engender blood is weaker.

This comparison reinforces the placement of baizhu in the Materia Medica section of tonic herbs and placement of cangzhu in the section of aromatic moisture-resolving herbs. The description of cangzhu, being aromatic, dissipating (with depression referring to stagnated qi circulation), drying, and upbearing all correspond to having a high level of volatile oils that spread out and float upward. By comparison, Dr. Jiao describes white atractylodes as sweet and bitter (thus, sweetness replacing aromatic) and only slightly warm. As to engendering blood, he goes on to mention that this property is brought out when white atractylodes is combined with blood supplementing herbs (e.g., tang-kuei).

The Advanced Textbook of Traditional Chinese Medicine and Pharmacology (5) focuses on the effects of the two types of atractylodes on perspiration:

Both baizhu and cangzhu strengthen the spleen and eliminate dampness. The former is sweet, bitter, and mild, and acts mainly to nourish the spleen and check perspiration; the latter is acrid, bitter, dry, and strong and acts mainly to dry dampness and induce perspiration. Therefore, baizhu is often used for spleen deficiency or deficiency of the defensive qi with spontaneous sweating, while cangzhu is usually applied for excess syndromes with dampness retained in the middle burner or exterior syndromes complicated by dampness.

The reference to control of sweating by baizhu is no doubt made with Jade Screen Formula (Yupingfeng San) in mind; that formula is used to treat or prevent spontaneous sweating in persons with weak spleen function and debilitated weiqi (defensive qi). With regard to cangzhu, it should be noted that the other herbs in the same Materia Medica category are also aromatic and dispersing (e.g., magnolia bark, citrus, cardamom), as are many of the herbs used to resolve exterior syndromes that are complicated by dampness (e.g., angelica and chiang-huo).

Rhizomes with rootlets and stems, freshly pulled Atractylodes lancea
Frequently, baizhu is processed by frying. As depicted in Pao Zhi: An Introduction to the Use of Processed Chinese Medicinals (6), the uncooked atractylodes can be used to promote urination and disperse fluid swelling; stir-frying produces a more astringent product, which is used to inhibit spontaneous sweating, inhibit miscarriage, protect against organ prolapse, and stop diarrhea. Yang Yifan specifically addresses the difference between the raw and fried baizhu in terms of its effects on the stomach-spleen (7).

Raw, baizhu is the strongest of the products [preparations of baizhu] to tonify the spleen qi and it treats reduced appetite, indigestion, tiredness, and a wan complexion. When baizhu is dry-fried, its action in drying dampness is increased. It is especially effective for treating distention in the abdomen, loose stools, and diarrhea. When the color of the herb turns to deep brown after dry frying (for a longer period), it is then called roasted baizhu. This enters the stomach meridian particularly and has the strongest effect [of the baizhu preparations] in strengthening the receiving, ripening, and transporting functions of the stomach. It is very useful for treating a poor appetite, nausea, fullness in the stomach, and belching.

**ACTIVE COMPONENTS**

The investigation of the aromatic oils is a key to understanding the atractylodes herbal materials, particularly cangzhu.

Atractylodes lancea is rich in a volatile oil, making up 3.5-7% of the dried rhizome, with atractylodin, D-eudesmol, hinesol, elemol, atractylone, and D-selinene; A. chinensis and other substitute species have less essential oil. The main constituents in the essential oils from the rhizome of A. chinensis are D-eudesmol and atractylone; A. lancea also has hinesol as a major constituent. D-eudesmol is a major component of the essential oil of magnolia bark, an herb in the same Materia Medica category as cangzhu. The fraction comprising the combination of hinesol and eudesmol in A. lancea is called atractylol, and this is the reddish substance appearing on the surface of the sliced rhizome, giving the name red atractylodes.

Atractylodes macrocephala (baizhu) has less essential oil than the cangzhu varieties, with only 0.35-1.35% and with atractylone as the main component, along with smaller amounts of other lactones having similar structure. The differences in chemical composition help confirm that the two herbs (cangzhu and baizhu) may have differing properties, further justifying their separation in the Materia Medica.

Since white atractylodes has little essential oil, and even less of it after being fried (the heat drives off or destroys volatile components), other active ingredients may be present to explain its functions. A component called atractylenolide (a group of sesquiterpene lactones; three noted thus far) is found in baizhu; this component increases with frying of the herb (highest in lightly fried herb, which has turned yellowish, not brown). In terms of the atractylodes effects, it is thought that these components may serve as antispasmodic agents, thus reducing intestinal contractions associated with diarrhea. Diuretic action, measured in laboratory animal experiments, has been attributed to both volatile and non-volatile compounds of atractylodes, including β-eudesmol, sesquiterpene lactones, and polyacetylenes (8).
REPRESENTATIVE FORMULAS IN WHICH WHITE ATRACTYLODES IS A MAIN COMPONENT

Most of the well-known prescriptions having white atractylodes as a main component are aimed at warming up the spleen and delivering water for elimination. Typically, the formulas include warm herbs such as cinnamon twig or ginger and/or they include the primary spleen-tonic herb ginseng. The following five formulations each have only four to five ingredients; the dosages, and uses listed here are as given in Thousand Herbs and Thousand Formulas of Traditional Chinese Medicine (9):

Li Zhong Wan

Atractylodes  9  
Ginseng  6  
Licorice  6  
Ginger  5

Used for deficiency and coldness of the middle burner, manifesting fullness in the epigastric region or abdomen relieved by pressure; abdominal pain, loss of appetite, diarrhea, vomiting.

Gancao Fuzi Tang

Atractylodes 12  
Aconite 12  
Licorice 12  
Cinnamon twig 12

Used for the combination of wind and damp, manifesting pain in the joints with motor impairment, sweating, aversion to wind, shortness of breath, difficult urination, or slight edema.

Wuling San

Atractylodes 9  
Alisma 15  
Polyergus 9  
Hoelen 9  
Cinnamon twig 6

Used for interior accumulation of water and exterior symptom-complex, manifesting headache, fever, thirst (with desire to drink), vomiting immediately after drinking, difficulty in urination; stagnation of water and dampness in the body, resulting in edema, diarrhea, dysuria, cholera, and vomiting; retention of fluid with manifestation of dizziness, spitting saliva, shortness of breath, cough, and palpitation below the naval.

Quansheng Baizhu San

Atractylodes 30  
Ginger peel 15  
Areca peel 15  
Citrus 15  
Hoelen 15

Used for edema that is due to excessive damp caused by spleen deficiency, especially during pregnancy.

Sijunzi Tang

Atractylodes 9  
Ginseng 10  
Hoelen 9  
Licorice 6

Used for deficiency of qi of the spleen and stomach, manifesting pale face, low voice, muscle weakness in the arms and legs, loss of appetite, diarrhea.

The last three of these formulas include atractylodes with hoelen (fuling). This pair of herbs is frequently recommended as an addition to numerous herb formulas when one wishes to dispel accumulated water. In the book Dui Yao: The Art of Combining Chinese Medicinals (10) this pairing is explained in detail. First, the two herbs are compared (note: the term “disinhibits urination” is used by the authors as a contrast to “promotes urination,” indicating that it only relieves some blockage or impairment to eliminating water by urination, but does not otherwise induce urination):

In combining the two herbs, it is said that: “Atractylodes supplements, while hoelen percolates; atractylodes dries, while hoelen disinhibits urination; when these two medicinals are combined together, they reinforce each other.”

The combination is said to be useful for:

Edema due to accumulation of dampness in turn caused by spleen deficiency; fatigue, weakness of the limbs, lack of appetite, loose stools, and diarrhea caused by spleen deficiency with accumulation of dampness; vertigo, blurred vision, and/or heart palpitations due to spleen dampness; and chronic cough due to phlegm dampness and spleen deficiency.

Here, reference to lack of appetite also infers lack of interest in drinking fluids.

There are two other formulations with white atractylodes as the main ingredient that are important to know and that are designed differently than the ones mentioned above. One is Yu
Pingfeng San (Jade Screen Formula) which has its focus on treating spontaneous sweating in persons with spleen qi deficiency, leading to deficiency of the surface (i.e., weakness of weiqi):

**Yu Pingfeng San**
- **Atractylodes**: 60
- **Astragalus**: 30
- **Siler**: 30

Used for spontaneous perspiration due to deficiency of exterior with weakened immunity.

The other is the simple combination of atractylodes with chih-shih (zhishi); this unusual combination involves treating deficiency and stagnation (a type of excess) simultaneously:

**Zhi Zhu Wan**
- **Atractylodes**: 60
- **Chih-shih**: 30

Used for abdominal fullness and distention due to deficiency of spleen, manifesting abdominal fullness or distention and anorexia.

**Representative Formulas in Which Red Atractylodes Is a Main Component**

There are relatively few well-known formulas with red atractylodes as the main ingredient; this herb is, instead, often found as a minor ingredient in larger formulas. The first two formulas described here treat damp accumulation of the abdomen with stomach distress.

**Yuequ Wan**
- **Red Atractylodes**: 9
- **Cyperus**: 9
- **Cnidium**: 9
- **Shen-chu**: 9
- **Gardenia**: 9

Used for stagnancy of qi, manifesting epigastric fullness and oppression, abdominal distention and pain, acid regurgitation, vomiting, and indigestion.

**Ping Wei San**
- **Red Atractylodes**: 15
- **Magnolia**: 9
- **Citrus**: 9
- **Licorice**: 5

Used for damp accumulation in the spleen and stomach, manifesting abdominal fullness, loss of appetite and taste, nausea, vomiting, belching, acid regurgitation, heavy sensation in the body, malaise, diarrhea.

This next formulation is an unusual pairing of a spicy warm herb with a bitter cold herb to treat damp-heat. It is very widely used as an addition to other formulas when damp-heat is an additional pattern. It is also used topically in the treatment of superficial damp-heat, such as for moist eczema.

**Er Miao San**
- **Red Atractylodes**: 15
- **Phellodendron**: 15

Used for low back pain caused by damp-heat pathogen weakness in both feet, red, feverish pain in the feet and knees, gynecological disease due to damp-heat pathogen, eczema of shank, concentrated yellow urine with short duration of micturition.
A CONTEMPORARY FORMULA RELYING ON ATRACTYLODES AS MAIN HERB

Atractylodes Tablets is a Seven Forests formula that is based on a modern Chinese clinical formula called Jianpi Ling that is used primarily for treating ulcerative colitis. According to the Chinese doctrine, by tonifying the qi, the disorder may go into long-term remission. The formula mainly tonifies qi and regulates the spleen function. The formula contains mume and catechu as intestinal astringents that normalize the intestinal mucosa, alleviate ulceration and bleeding. The formula is intended for a course of therapy lasting several months to resolve a chronic disorder; it may be used at high dosage for short treatment of diarrhea following infection or antibiotic use.

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APPENDIX

CASE STUDY OF ATRACTYLODES LANCEA AND EXHAUSTION OF WILD PLANT RESOURCES

The following is a slightly edited version of a presentation made by workers at the Jiangsu Institute of Botany in 1995 (11) regarding cangzhu, followed by a more recent report of growing commercial quantities of baizhu (Atractylodes macrocephala).

Atractylodes lancea is an example of species of which the natural population size has decreased seriously as a result of intensive collection. This plant is mainly used for the treatment of indigestion and stomach disorders. Although A. lancea (cangzhu) is widely distributed in central China, the traditional, high quality medicinal material, called Mao cangzhu, comes from the Maoshan hills, a famous Taoist retreat area in Jiangsu Province. The production of this crude drug in Jiangsu Province has ranged from 1.2 to 6.6 tons per year (1,100 to 7,200 kg/year). Based on the production figures for A. lancea in five counties of Jiangsu Province (Juroug, Jintan, Lishui, Liyang and Gaochun), the highest production was recorded in the

ATRACTYLODES TABLETS

INGREDIENTS

Atractylodes  baizhu
Astragalus  huangqi
Codonopsis  dangshen
Tang-kuei  danggui
Ginger  paogiang
Peony  baishao
Catechu  ercha
Corydalis  yanhusuo
Saussurea  muxiang
Mume  wumei
Licorice  gancao

GENERAL ACTIVITIES

tonify qi, regulate qi, astringe

SAMPLE INDICATIONS

ulcerative colitis, Crohn’s disease, diverticulitis, diarrhea, abdominal aching, hemorrhoids
1950s. The figures for the 1980s (just 1.2 tons in 1983) were much lower than those for the 1960s and 1970s, and resources of A. lancea were seriously being depleted in all five counties. It was suggested that the existing wild resources would only last for 10-20 years if no steps are taken towards conservation. The slow growth rate of the species is an important reason for such a rapid depletion. Experiments to measure growth rates have shown that the rhizome grows only to twice its original size in any given year. Protection and cultivation are therefore absolutely essential for A. lancea.

Although the Maoshan area is the famous region for cangzhu, the species is distributed over a wide area including the provinces of Jiangsu, Zhejiang, Shandong, Anhui, Hubei and Sichuan. Based on the data for Jiangsu, Anhui and Hubei provinces, it grows at altitudes from 60 to 1,000 m above sea level. The sites investigated have a relatively similar climatic pattern (except for precipitation, which varied between sites from 850 to 1,560 mm per year). Soils are mostly acidic, about pH 5, and occasionally alkaline, pH 7.5. The rocks are mostly granite and quartzite, but also limestone in places. High density distributions of A. lancea are usually found only on the north facing slopes.

Morphological differences have been observed between plants growing under different ecological conditions. For verifying the morphological differences which are genuinely due to genetic factors, plant samples were collected and cultivated in the Nanjing Botanical Garden experimental plots. Collections from various designated sites were propagated vegetatively. Plants of different provenances had different leaf shapes and it has been confirmed that these are due to real genetic variation among them.

Morphological information alone is not sufficient for making decisions concerning the choice of appropriate provenances for conservation or cultivation. For these purposes, it is also essential to know the active principle content of the plant material. Analyses of the major active constituents of A. lancea showed that not only could plants growing in different geographic areas with different morphological characteristics have different chemical constituents but also plants with similar morphological features and growing on the same site may have different contents of chemical constituents. For example, analyses carried out on 144 samples collected from four sites in Jiangsu Province with similar morphological features indicated that there were at least two variations with respect to the presence or absence of chemical constituents: one type contained all four major constituents (attractylon, atracylodin, hinesol, and eudesmol) while the second type was missing hinesol and eudesmol.

For conservation we may obtain specimens exhibiting different characteristics including morphological and chemical variations, and keep them in the collection. But for the choice of material for cultivation, more studies need to be carried out on the clinical effectiveness of the different provenances, especially based on their chemical composition. This kind of research usually takes a relatively long time. This example illustrates the complexity of the various issues involved in the conservation and cultivation of medicinal plants.

White atractylodes (Atractylodes macrocephala) rhizome is one of the eight major medicinal herbs in Zhejiang Province, and Xichang county is the principal growing region. According to Xinchang county recordings, “white atractylodes rhizome has been a major agricultural product along with tea, tobacco and silkworms. Its annual sale comes up to some two million plants.” The unique geographical position and natural climate in Xinchang are favorable for its cultivation. For several centuries, the mountain farmers had been living on growing this herb and accumulated a reservoir of experience. After the founding of new China, the cultivation has been expanded and the annual yield in recent years has jumped up to 750,000-800,000 kg.