

Section 3

— Blood-Tonifying Herbs

Dang Gui (Radici^s Angelicae Sinensis)



當歸 当归

Pinyin Name: *Dang Gui*

Literal Name: “state of return,” “ought to return”

Alternate Chinese Names: *Xi Gui, Gan Gui, Quan Dang Gui, Qin Dang Gui, Yun Dang Gui, Chuan Dang Gui*

Original Source: *Shen Nong Ben Cao Jing* (Divine Husbandman’s Classic of the Materia Medica) in the second century

English Name: tangkuei, angelica root, dong quai, Chinese angelica

Botanical Name: *Angelica sinensis* (Oliv.) Diels (*Dang Gui*)

Pharmaceutical Name: Radici^s Angelicae Sinensis

Properties: sweet, acrid, warm

Channels Entered: Heart, Liver, Spleen

CHINESE THERAPEUTIC ACTIONS

1. Tonifies Blood

Heart and Liver blood deficiencies: Symptoms of Heart and Liver blood deficiencies include anemia, pale complexion, brittle nails, dry hair, dizziness, blurred vision, and palpitations. *Dang Gui* (Radici^s Angelicae Sinensis), warm in nature, is most suitable for cold-type blood-deficient patients. It also treats abdominal pain related to blood deficiency and coldness.

- Blood deficiency: combine *Dang Gui* with *Shu Di Huang* (Radix Rehmanniae Preparata), *Bai Shao* (Radix Paeoniae Alba), and *Chuan Xiong* (Rhizoma Ligustici Chuanxiong) to enhance the blood-tonifying effect. **Exemplar Formula:** *Si Wu Tang* (Four-Substance Decoction). This formula tonifies blood, regulates the menstrual cycle and is used for various patterns of blood deficiency.
- Blood and qi deficiencies: pair it with *Huang Qi* (Radix Astragali). **Exemplar Formula:** *Dang Gui Bu Xue Tang* (Tangkuei Decoction to Tonify the Blood). This formula is commonly used as a tonic for postpartum fatigue and weakness.

- Spleen and Heart deficiencies characterized by insomnia with excessive dreaming and worry, fatigue, palpitations, forgetfulness and difficulty falling asleep: combine *Dang Gui* with *Ren Shen* (Radix Ginseng), *Bai Zhu* (Rhizoma Atractylodis Macrocephalae), *Long Yan Rou* (Arillus Longan), *Suan Zao Ren* (Semen Zizyphi Spinosae), and similar tonics. **Exemplar Formula:** *Gui Pi Tang* (Restore the Spleen Decoction).
- Blood deficiency with deficiency-heat symptoms, hot flashes, irritability, flushed cheeks: use it with *Mu Dan Pi* (Cortex Moutan), *Sheng Di Huang* (Radix Rehmanniae), *Chi Shao* (Radix Paeoniae Rubrae), and *Huang Qin* (Radix Scutellariae).
- Epigastric and abdominal pain and coldness due to blood deficiency and Spleen and Stomach deficiencies: use *Dang Gui* with *Sheng Jiang* (Rhizoma Zingiberis Recens), *Gui Zhi* (Ramulus Cinnamomi), *Bai Shao* (Radix Paeoniae Alba) and *Yi Tang* (Saccharum Granorum). *Dang Gui* is commonly cooked with lamb to make soup.

Dang Gui (Radicis Angelicae Sinensis)

2. Invigorates Blood Circulation and Relieves Pain

Menstrual disorders: Blood deficiency, blood stagnation or qi stagnation all result in menstrual disorders such as irregular menstrual cycle, dysmenorrhea, amenorrhea and other gynecological disorders. Because of the warm property of *Dang Gui* and its action to nourish the blood and invigorate circulation, it is most suitable for treatment of cold types of menstrual disorders with blood and qi stagnation.

- Amenorrhea due to blood deficiency and stagnation: combine *Dang Gui* with *Hong Hua* (Flos Carthami), *Tao Ren* (Semen Persicae), *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), and *Chi Shao* (Radix Paeoniae Rubrae). **Exemplar Formulas:** *Tao Hong Si Wu Tang* (Four-Substance Decoction with Safflower and Peach Pit) and *Shao Fu Zhu Yu Tang* (Drive Out Blood Stasis in the Lower Abdomen Decoction).
- Amenorrhea or irregular menstruation because of cold and deficiency: combine it with *Wu Zhu Yu* (Fructus Evodiae), *Gui Zhi* (Ramulus Cinnamomi), *Ren Shen* (Radix Ginseng), and *Chuan Xiong* (Rhizoma Ligustici Chuanxiong). **Exemplar Formula:** *Wen Jing Tang* (Warm the Menses Decoction).
- Dysmenorrhea due to cold and deficiency: use this herb with *Wu Ling Zhi* (Excrementum Trogopteri seu Pteromi), *Pu Huang* (Pollen Typhae) and *Yan Hu Suo* (Rhizoma Corydalis). **Exemplar Formula:** *Shi Xiao San* (Sudden Smile Powder).
- Pre-menstrual syndrome, irregular menstruation caused by Liver qi stagnation: add it to *Chai Hu* (Radix Bupleuri), *Bai Shao* (Radix Paeoniae Alba), *Bai Zhu* (Rhizoma Atractylodis Macrocephalae), and *Fu Ling* (Poria). **Exemplar Formula:** *Xiao Yao San* (Rambling Powder).
- Early menstruation, bloating during menstruation, irritability from heat and qi stagnation: add *Dang Gui* to *Mu Dan Pi* (Cortex Moutan), *Zhi Zi* (Fructus Gardeniae), *Chai Hu* (Radix Bupleuri) and *Bai Shao* (Radix Paeoniae Alba). **Exemplar Formula:** *Jia Wei Xiao Yao San* (Augmented Rambling Powder).
- General menstrual disorders with fatigue and weakness due to qi and blood deficiencies: combine this herb with *Ren Shen* (Radix Ginseng), *Bai Zhu* (Rhizoma Atractylodis Macrocephalae), *Shu Di Huang* (Radix Rehmanniae Preparata) and *Bai Shao* (Radix Paeoniae Alba). **Exemplar Formula:** *Ba Zhen Tang* (Eight-Treasure Decoction).
- Menopausal symptoms due to yin deficiency with heat: use *Dang Gui* with *Xian Mao* (Rhizoma Curculiginis), *Yin Yang Huo* (Herba Epimedii), *Zhi Mu* (Radix Anemarrhenae), *Huang Bai* (Cortex Phellodendri), and *Ba Ji Tian* (Radix Morindae Officinalis). **Exemplar Formula:** *Er Xian Tang* (Two-Immortal Decoction).

Gestational and postpartum disorders: *Dang Gui* enters the *xue* (blood) level. It functions to tonify yet does not have the stagnant side effects seen in other tonic herbs. It is also frequently used to treat disorders caused by cold, blood deficiency and blood stagnation before or after deliveries.

- Abdominal pain during pregnancy: combine *Dang Gui* with *Chuan Xiong* (Rhizoma Ligustici Chuanxiong).
- Pain and diarrhea during pregnancy: use it with *Bai Shao* (Radix Paeoniae Alba), *Fu Ling* (Poria), *Bai Zhu* (Rhizoma Atractylodis Macrocephalae), and *Ze Xie* (Rhizoma Alismatis).
- Restless fetus, lower back soreness, abdominal pain and breech presentation of the fetus: incorporate it with *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), *Jing Jie* (Herba Schizonepetae), *Tu Si Zi* (Semen Cuscutae), *Ai Ye* (Folium Artemisiae Argyi), and *Hou Po* (Cortex Magnoliae Officinalis). **Exemplar Formula:** *Bao Chan Wu You Fang* (Preserve Pregnancy and Care Free Decoction).
- Postpartum spontaneous sweating, fever, shortness of breath, and back and leg pain accompanied by an inability to turn from side to side: combine this herb with *Huang Qi* (Radix Astragali), *Bai Shao* (Radix Paeoniae Alba), and *Sheng Jiang* (Rhizoma Zingiberis Recens).
- Postpartum bleeding, lower abdominal coldness and pain caused by blood deficiency with cold: use it with *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), *Tao Ren* (Semen Persicae), *Pao Jiang* (Rhizoma Zingiberis Preparatum), and *Gan Cao* (Radix Glycyrrhizae). **Exemplar Formula:** *Sheng Hua Tang* (Generation and Transformation Decoction).
- Insufficient milk due to blood and qi deficiencies: add this herb to *Ren Shen* (Radix Ginseng), *Huang Qi* (Radix Astragali), *Mai Men Dong* (Radix Ophiopogonis), *Chuan Mu Tong* (Caulis Clematidis Armandii), peanuts and pig's feet.
- Postpartum *bi zheng* (painful obstruction syndrome): combine *Dang Gui* with *Qiang Huo* (Rhizoma et Radix Notopterygii), *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), and *Qin Jiao* (Radix Gentianae Macrophyllae).

Traumatic Injuries: *Dang Gui*, acrid in taste, activates blood circulation and disperses blood stagnation. If blood stagnation is dispersed, swelling will automatically subside. *Dang Gui* is commonly used in trauma departments in hospitals in China, along with blood-activating herbs, to treat the following symptoms: bruises, fractured or broken bones, swelling, and injuries of the tendons.

- Traumatic injuries of the thoracic cavity: combine *Dang Gui* with *Chai Hu* (Radix Bupleuri), *Chuan Shan Jia* (Squama Manis), *Da Huang* (Radix et Rhizoma Rhei), and *Hong Hua* (Flos Carthami). **Exemplar Formulas:**

Dang Gui (Radix Angelicae Sinensis)

Xue Fu Zhu Yu Tang (Drive Out Stasis in the Mansion of Blood Decoction) or *Fu Yuan Huo Xue Tang* (Revive Health by Invigorating the Blood Decoction).

- Bruises, swelling and redness from traumatic injuries: add this herb to *Su Mu* (Lignum Sappan), *Ru Xiang* (Gummi Olibanum), *Mo Yao* (Myrrha), and *Di Bi Chong* (Eupolyphaga).
- Broken or fractured bones: use it with *Ru Xiang* (Gummi Olibanum), *Mo Yao* (Myrrha), *Zi Ran Tong* (Pyritum), and *Gu Sui Bu* (Rhizoma Drynariae).

Bi zheng (painful obstruction syndrome) with numbness and pain: Besides tonifying blood and invigorating circulation, *Dang Gui* stops pain and disperses coldness. By dispersing stagnation and promoting nourishment in the channels and tendons, *Dang Gui* treats numbness and pain in the limbs and extremities. It is used for pain caused by blood deficiency, blood deficiency complicated by coldness and wind, or qi and blood deficiencies.

- Numbness due to blood deficiency: combine *Dang Gui* with *Huang Qi* (Radix Astragali), *Chi Shao* (Radix Paeoniae Rubrae), *Shu Di Huang* (Radix Rehmanniae Preparata), and *Chuan Xiong* (Rhizoma Ligustici Chuanxiong).
- Coldness of the extremities, back, and/or buttocks due to blood and yang deficiencies: add this herb to *Gui Zhi* (Ramulus Cinnamomi), *Bai Shao* (Radix Paeoniae Alba), *Xi Xin* (Herba Asari), and *Chuan Mu Tong* (Caulis Clematidis Armandii). **Exemplar Formula:** *Dang Gui Si Ni Tang* (Tangkuei Decoction for Frigid Extremities).
- *Bi zheng* (painful obstruction syndrome), painful joints, and/or numbness due to *ying* (nutritive) and *wei* (defensive) deficiencies: combine this herb with *Huang Qi* (Radix Astragali), *Jiang Huang* (Rhizoma Curcumae Longae), *Chi Shao* (Radix Paeoniae Rubrae), and *Fang Feng* (Radix Saposhnikoviae). **Exemplar Formula:** *Juan Bi Tang* (Remove Painful Obstruction Decoction).
- Soreness and weakness of lower back and knees due to qi, blood, Liver and Kidney deficiencies: use it with *Du Huo* (Radix Angelicae Pubescentis), *Sang Ji Sheng* (Herba Taxilli), *Qin Jiao* (Radix Gentianae Macrophyllae), and *Sheng Di Huang* (Radix Rehmanniae). **Exemplar Formula:** *Du Huo Ji Sheng Tang* (Angelica Pubescens and Taxillus Decoction).

Sores and abscesses: Applied topically, *Dang Gui* reduces swelling, expels pus, generates flesh and relieves pain. Because it is warm and nourishing in nature, it is most suitable when taken internally for slow healing sores from qi and blood deficiencies.

- Slow-healing sores due to qi and blood deficiencies: *Dang Gui* is used alone topically, or combined with *Huang Qi* (Radix Astragali), *Jin Yin Hua* (Flos

Lonicerae), *Gan Cao* (Radix Glycyrrhizae), *Bai Zhi* (Radix Angelicae Dahuricae), and red *Da Zao* (Fructus Jujubae) for internal use.

- Toxic ulcers with pus: add this herb to *Huang Qi* (Radix Astragali), *Chuan Shan Jia* (Squama Manis), *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), and *Zao Jiao Ci* (Spina Gleditsiae), to drain pus.
- Redness, swelling and burning toxic sores: combine *Dang Gui* with *Jin Yin Hua* (Flos Lonicerae), *Chi Shao* (Radix Paeoniae Rubrae), *Zhe Bei Mu* (Bulbus Fritillariae Thunbergii), *Tian Hua Fen* (Radix Trichosanthis), and *Chuan Shan Jia* (Squama Manis). **Exemplar Formula:** *Zhen Ren Huo Ming Yin* (True Man Decoction to Revitalize Life).
- Ulcerated sores with redness, swelling and pain: use *Dang Gui* with a large dose of *Jin Yin Hua* (Flos Lonicerae), *Gan Cao* (Radix Glycyrrhizae), and *Xuan Shen* (Radix Scrophulariae). **Exemplar Formula:** *Si Miao Yong An Tang* (Four-Valiant Decoction for Well-Being).
- Chronic non-healing ulcerated sores caused by qi and blood deficiencies: use *Dang Gui* with *Huang Qi* (Radix Astragali), *Rou Gui* (Cortex Cinnamomi), *Shu Di Huang* (Radix Rehmanniae Preparata) and *Ren Shen* (Radix Ginseng). **Exemplar Formula:** *Shi Quan Da Bu Tang* (All-Inclusive Great Tonifying Decoction).

3. Moistens Intestines and Unblocks the Bowels

Constipation due to blood deficiency: When the bowels are not properly nourished by blood, constipation or dry stools result. Usually the elderly, or those who have chronic constipation, or are postpartum women, or are in late or recovery stages of chronic disorders suffer this type of constipation. *Dang Gui* nourishes the blood and moistens the intestines to promote bowel movement.

- Constipation due to blood deficiency: combine *Dang Gui* with *He Shou Wu* (Radix Polygoni Multiflori), *Huo Ma Ren* (Fructus Cannabis), *Tao Ren* (Semen Persicae), *Rou Cong Rong* (Herba Cistanches), *Sheng Di Huang* (Radix Rehmanniae), *Shu Di Huang* (Radix Rehmanniae Preparata), and *Da Huang* (Radix et Rhizoma Rhei). **Exemplar Formula:** *Ji Chuan Jian* (Benefit the River [Flow] Decoction).

4. Stops Cough and Treats Dyspnea

Cough and dyspnea: *Dang Gui* is often used with herbs that transform phlegm and stop cough.

- Cough, dyspnea, shortness of breath, and profuse sputum: combine this herb with *Su Zi* (Fructus Perillae), *Ban Xia* (Rhizoma Pinelliae), *Hou Po* (Cortex Magnoliae Officinalis), and *Qian Hu* (Radix Peucedani). **Exemplar Formula:** *Su Zi Jiang Qi Tang* (Perilla Fruit Decoction for Directing Qi Downward).

Dang Gui (Radicis Angelicae Sinensis)

- Coughing during the night, dyspnea, profuse, salty-tasting sputum caused by Kidney and Lung yin deficiencies: combine *Dang Gui* with a large dose of *Chen Pi* (Pericarpium Citri Reticulatae), *Ban Xia* (Rhizoma Pinelliae), *Fu Ling* (Poria), and *Gan Cao* (Radix Glycyrrhizae).

DOSAGE

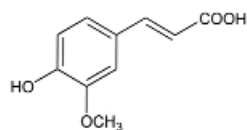
5 to 15 grams. *Dang Gui* is used in decoctions, herbal tincture, plasters, pills, or powder. Unprocessed *Dang Gui* is commonly used to tonify the blood, regulate menstruation, and lubricate the bowels. *Dang Gui* dry-fried with grain-based liquor more strongly moves the blood, and is commonly used to treat menstrual pain, traumatic bruises and pain, *bi zheng* (painful obstruction syndrome), and cases of blood stagnation. Dry-frying increases its warmth, which makes it an ideal agent to tonify the blood without causing diarrhea. The charred herb stops bleeding.

CAUTIONS / CONTRAINDICATIONS

- Use *Dang Gui* with caution for patients with abdominal distention, Spleen deficiency, or those with loose stools or diarrhea.
- *Dang Gui* is contraindicated in excess conditions, or for patients with yin-deficient heat signs.

CHEMICAL COMPOSITION

Essential oils 0.2 to 0.4% (ligustilide, n-butylidene phthalide, n-butylphthalide, n-valero-phenone-O-carboxylic acid); ferulic acid, scopletin.^{1,2}



Ferulic Acid

PHARMACOLOGICAL EFFECTS

- **Effects on the uterus:** Administration of *Dang Gui* is associated with both stimulating and inhibiting effects on the smooth muscle of the uterus. Laboratory studies have shown that water and alcohol extracts tend to stimulate the uterus, while the essential oil inhibits it.³ Furthermore, clinical studies have shown that when the uterus is in a state of relaxation, *Dang Gui* can induce contraction. Conversely, if the uterus is in a contracted state, then *Dang Gui* promotes relaxation. This dual action is credited for the therapeutic effect of relieving spasms and stopping pain.⁴
- **Cardiovascular:** In one laboratory study using frog specimens, intravenous injection of *Dang Gui* was associated initially with an inhibitory influence on the heart, fol-

lowed by a negative chronotropic effect and positive inotropic effect. It improves overall blood circulation by decreasing the whole blood specific viscosity, or improving the hemorrhheological changes in "blood stagnation." It also has an antiarrhythmic effect, especially against arrhythmia induced by epinephrine, cardiac glycosides, aconitine, and barium chloride. Administration of *Dang Gui* is associated with reduction of plasma cholesterol and triglyceride levels, and a decreased risk of atherosclerosis, as demonstrated in laboratory studies.^{5,6,7,8}

- **Antiplatelet:** Administration of *Dang Gui* in rats is associated with a marked antiplatelet effect, similar to that of aspirin.⁹ Other studies have demonstrated that *Dang Gui* also inhibits thrombus formation.¹⁰
- **Immunostimulant:** Administration of *Dang Gui* is associated with an increase in phagocytic activity by the macrophages.¹¹
- **Respiratory:** *Dang Gui* has demonstrated a beneficial effect in treating wheezing and dyspnea caused by bronchospasm.¹²
- **Hepatoprotective:** *Dang Gui* promotes the generation of hepatocytes and has demonstrated a marked hepatoprotective effect.¹³
- **Antibiotic:** It shows inhibitory activity against *Salmonella typhi*, *E. coli*, *Corynebacterium diphtheriae*, *Vibrio cholerae*, α -hemolytic streptococcus and β -hemolytic streptococcus.¹⁴
- **Analgesic and anti-inflammatory:** Extract of *Dang Gui* has analgesic and anti-inflammatory effects similar to those of acetylsalicylic acid. It decreases vascular permeability to reduce inflammation.¹⁵ Its anti-inflammatory effect is approximately 1.1 times stronger than acetylsalicylic acid, and its analgesic effect is approximately 1.7 times stronger than acetylsalicylic acid.^{16,17}

CLINICAL STUDIES AND RESEARCH

- **Cough and wheezing:** In one clinical study, essential oil of *Dang Gui* given three times daily for 7 days was found to be 90.2% effective in treating 51 patients with coughing and wheezing. Most patients began to respond to the herbal treatment within 2 to 3 hours, with maximum effect shown at 8 to 24 hours.¹⁸
- **Low back and leg pain:** An herbal injection containing *Dang Gui* and *Chuan Xiong* (Rhizoma Ligustici Chuanxiong) was found to be 97% effective in relieving pain when administered to the affected area once daily or every other day for 10 days.¹⁹
- **Arrhythmia:** According to one report, 100 patients with arrhythmia were treated with two *Dang Gui* preparations, with 83.3% rate of effectiveness. The first preparation was intravenous infusion of 60 to 120 ml of 25 to 50% *Dang Gui* preparation once daily for 15 days. The

Dang Gui (Radix Angelicae Sinensis)

14. *Huo Xue Hua Yu Yan Jiu* (Research on Blood-Activating and Stasis-Eliminating Herbs), 1981:335
15. *Xin Yi Yao Xue Za Zhi* (New Journal of Medicine and Herbology), 1975; (6):34
16. *Yao Xue Za Zhi* (Journal of Medicinals), 1971; (91):1098
17. *Ibid.*
18. *Tian Jing Zhong Yi* (Tianjing Chinese Medicine), 1986; 1:4
19. *Xin Zhong Yi* (New Chinese Medicine), 1980; 2:34
20. *Zhong Yi Za Zhi* (Journal of Chinese Medicine), 1981; 7:54
21. *Shen Jing Jing Shen Ji Bing Za Zhi* (Journal of Psychiatric Disorders), 1981; 4:222
22. *Bei Jing Yi Xue* (Beijing Medicine), 1988; 2:95
23. *Xin Yi Xue* (New Medicine), 1976; 6:294
24. *Xin Yi Yao Xue Za Zhi* (New Journal of Medicine and Herbology), 1976; 12:26
25. *Liao Ning Zhong Yi Za Zhi* (Liaoning Journal of Chinese Medicine), 1982; 6:40
26. *Zhong Yi Yao Xin Xi* (Information on Chinese Medicine and Herbology), 1985; 3:18
27. *Chi Jiao Yi Sheng Za Zhi* (Journal of Barefoot Doctors), 1977; 4:21
28. *Lan Zhou Yi Xue Yuan Xue Bao* (Journal of Lanzhou University of Medicine), 1988; 1:36
29. *Yao Xue Tong Bao* (Report of Herbology), 1979; 7:310
30. *Zhong Xi Yi Jie He Za Zhi* (Journal of Integrated Chinese and Western Medicine), 1983; 5:319
31. *Xin Yi Yao Xue Za Zhi* (New Journal of Medicine and Herbology), 1977; 11:35
32. *Zhong Hua Yi Xue Za Zhi* (Chinese Journal of Medicine), 1961; 5:317
33. *Shan Xi Zhong Yi* (Shanxi Chinese Medicine), 1987; 9:419
34. *Zhong Yi Yao Xue Bao* (Report of Chinese Medicine and Herbology), 1981; 4:34
35. *Shan Xi Yi Yao Za Zhi* (Shanxi Journal of Medicine and Herbology), 1975; 5:69
36. *Zhong Xi Yi Jie He Za Zhi* (Journal of Integrated Chinese and Western Medicine), 1986; 9:536
37. *Tian Jing Zhong Yi* (Tianjing Chinese Medicine), 1986; 4:10
38. *Hu Bei Zhong Yi Za Zhi* (Hubei Journal of Chinese Medicine), 1986; 5:49
39. *Liao Ning Zhong Yi Za Zhi* (Liaoning Journal of Chinese Medicine), 1986; 4:36
40. *Bei Jing Yi Xue* (Beijing Medicine), 1980; 1:47
41. Chan-K. Lo-AC, Yeung-JH, and Woo-KS. *Journal of Pharmacy and Pharmacology*, (1995, May) vol. 47(5):402-6
42. *Pharmacotherapy* 1999, July; 19(7):870-876
43. *European Journal of Drug Metabolism and Pharmacokinetics*. 20(1):55-60, 1995
44. Hsieh MT et al., Radix Angelica Sinensis extracts ameliorate scopalamine- and cycloheximide-induced amnesia, but not p-chloroamphetamine-induced amnesia in rats. *American Journal of Chinese Medicine*. 28(2):263-72, 2000
45. *Zhong Guo Yao Li Tong Xun* (Journal of Chinese Herbal Studies), 1992; 9(1):52
46. *Chong Qing Yi Yao* (Chongqing Medicine and Herbology), 1989; 18(4):39
47. *Zhong Cao Yao* (Chinese Herbal Medicine), 1981; 12(7):33
48. *Guo Wai Yi Yao Zhi Wu Yao Fen Ce* (Monograph of Foreign Botanical Medicine), 1993; 8(3):116