On the Processing of Fu Zi

By Eric Brand

Fu Zi, which is derived from the processed lateral root of cultivated Aconitum carmichaeli Debx., has been a famous substance for warming yang throughout the history of Chinese medicine. Considered to be pure yang in nature, Fu Zi is a hot, acrid medicinal with diverse applications. Although Fu Zi is a toxic medicinal by nature, its traditional pao zhi processing reduces its toxicity substantially, allowing it to be used internally.

Ancient Processing Methods

Pao zhi techniques have been used for Fu Zi since ancient times, and over 70 different processing methods have been recorded in the historical literature. Today, four main processing methods have recorded standards in the Chinese Pharmacopoeia, and products derived from several additional processing methods can be found in local production regions and international trade. Fu Zi cultivation has been centered in Sichuan province for centuries, and the "daodi" production region of Jiangyou county, Sichuan, remains the largest center for cultivation in the modern day. In addition to Sichuan, Fu Zi is also cultivated in Shaanxi province; unlike the medicinal Cao Wu (Aconiti Kusnezoffii Radix), which comes from wild aconite, Fu Zi and Chuan Wu (Aconiti Radix) are only derived from cultivated plants.

Fu Zi first appeared in Chinese medical literature in the Shen Nong Ben Cao Jing ("Divine Farmer's Materia Medica"), but no mention of its processing method was given. Many famous Fu Zi-containing formulas were featured in the Shang Han Lun and Jin Gui Yao Lue in the Han dynasty, and two main processing methods are mentioned. In the formula Si Ni Tang (Counterflow Cold Decoction), the Fu Zi is described as "sheng" (unprocessed), with the skin removed; while the Fu Zi does not appear to have been processed, it was long-boiled with Gan Cao (licorice) and Gan Jiang (dried ginger) in the decoction process. In the formula Zhen Wu Tang (True Warrior Decoction), the Fu Zi is described as "pao" (blast-fried), with the skin removed.

In ancient times, the method of "long-boiling" was used to reduce the toxicity of raw Fu Zi in formula applications such as Si Ni Tang, but in modern times cooked, processed forms of Fu Zi are used instead. The processed form of Fu Zi known as "Dan Fu Pian" (desalted Fu Zi) is often selected for returning yang and stemming counterflow. "Pao Fu Zi" (blast-fried Fu Zi) is still commonly used, and it is considered to be best for warming the kidney and spleen and supplementing fire at the gate of vitality (ming men). In modern times, unprocessed Fu Zi is rarely used outside of the context of external application.

From the Han dynasty (during the time of Zhang Zhong-Jing), through the Tang dynasty (around the time of Sun Si-Miao), most processing methods related to Fu Zi relied on fire, such as blast-frying, roasting, and stir-frying. By the Song dynasty, the basic concept of fire-processing was expanded to incorporate processing with liquids, such as washing in water, soaking in water, brine, vinegar, or child's urine, as well as processing with other medicinals. Such processing methods included steeping in ginger juice, stir-frying with Huang Lian, boiling with black beans, processing with licorice or boiling with clamshells and ginger. After the Ming dynasty, processing methods tended to follow previous trends and
the adjuvant materials generally became more established, and by the Qing dynasty additional techniques such as simple steaming came into use.

**Understanding the Basic Chemistry and Toxicity of Fu Zi**

The processing methods used for Fu Zi reduce its natural toxicity so that it can be used internally. Different preparations of aconite are used in Chinese medicine for different purposes, and some of the traditional differences between medicinals such as Fu Zi, Chuan Wu, and Cao Wu in terms of clinical application and processing can be understood through the lens of modern pharmacology.

It is understood that aconitine alkaloids are closely related to the toxicity and therapeutic applications of aconite products, including Fu Zi, Chuan Wu, and Cao Wu. The toxicity of aconite products is closely related to the diester diterpenoid alkaloids aconitine, mesaconitine, and hypaconitine. Aconitine, the most potent of these alkaloids, is extremely toxic with an oral lethal dose in humans of only 1-5 mg. Fortunately, the traditional methods of processing used in Chinese medicine naturally reduce the toxicity of these alkaloids, allowing the finished products to be safely used internally. During processing, aconitine molecules are transformed into monoester and non-ester diterpenoid alkaloids (benzylaconines andaconines), which have only a tiny fraction of the toxicity of the original diester diterpenoid alkaloids. (Planta Med 2010)

In terms of pharmacology, aconitine alkaloids have analgesic, anti-inflammatory, and anesthetic effects. In clinical practice, items that are naturally high in these toxic and analgesic aconitine alkaloids tend to be used for conditions such as wind-cold-damp impediment (manifesting in conditions such as joint pain). Traditionally, highly potent and toxic medicinals such as Chuan Wu (central root of cultivated aconite) and Cao Wu (wild aconite root) were thought to strongly dispel cold and relieve pain, and their use corresponds with their naturally higher levels of aconitine alkaloids. Fu Zi is also considered to be effective for wind-cold-damp impediment, but its action of dispelling cold and relieving pain is considered to be more moderate than that of Chuan Wu and Cao Wu. Processed Fu Zi (the lateral root of cultivated aconite) is traditionally considered to have a more moderate action than Cao Wu or Chuan Wu in terms of dispelling cold and relieving pain. This moderate action is reflected in the lower aconitine alkaloid content of Fu Zi when compared with Chuan Wu or Cao Wu.

Beyond dispelling cold and relieving pain, Fu Zi is traditionally associated with a number of actions not seen in medicinals such as Chuan Wu and Cao Wu. Notably, Fu Zi is associated with warming the spleen and kidney, as well as returning yang and stemming counterflow for critical conditions known as yang desertion. Beyond its naturally lower content of aconitine alkaloids, Fu Zi is characterized by a number of other constituents (higenamine, coryneine chloride, uracil, and salsolinol) that have cardiac effects and anti-arrhythmic effects; these constituents are thought to be related to Fu Zi’s ability to return yang and stem counterflow. Interestingly, while aconitine itself induces arrhythmia, the use of traditional processing reduces the toxic aconitine alkaloids dramatically, allowing Fu Zi to be used at dosages that allow these other constituents to exert their effects. Additionally, polysaccharides found in Fu Zi have been reported to reduce blood sugar and inhibit tumor growth in mice. (Zhao 2010)
Modern Processing Methods

In the modern day, Fu Zi products derived from about 10 different processing methods can be found on the Chinese market, and four specific forms are listed in the Chinese Pharmacopoeia. The four forms listed in the Chinese Pharmacopoeia include: 1) Dan Fu Pian, 2) Hei Shun Pian, 3) Pao Fu Pian, and 4) Bai Fu Pian. These forms can be directly used in decoctions.

In the U.S. market, the main items seen are Hei Shun Pian (also called Hei Fu Pian) and Bai Fu Pian, although steamed Fu Zi (sold as Shou Fu Zi) and blast-fried Fu Zi (often sold as Pao Tian Xiong) can be seen as well. [Note: Bai Fu Pian, literally “white Fu Zi slices,” are sometimes mistakenly traded under the name Bai Fu Zi, which should correctly refer to a different medicinal- Typhonii Gigantei Rhizoma, which is also known as Yu Bai Fu.]

Fu Zi is harvested from the end of June to early August, and the cleaned lateral roots are separated from the main root and rootlets. At this initial processing stage the item is known as “nifuzi,” literally “muddy Fu Zi.” Within the first 24 hours of harvest, the freshly-harvested roots need to be soaked in a solution of mineral salts to prevent rot. This mineral salt solution, known as “dan ba,” is a product that is traditionally used in Fu Zi processing to preserve the fresh roots and reduce toxicity; dan ba is an edible, salty mineral substance that is produced as a by-product of salt processing (basically the dregs after pure salt is made). Sichuan was historically a major center of salt production in China, and salt-processing for Fu Zi has been prevalent for centuries based on the concept that the salty flavor enters the kidney.

Yan Fu Zi: Yan Fu Zi is salted Fu Zi; it is not commonly used directly in decoctions, but rather is used to make further refined forms of Fu Zi such as Dan Fu Pian (desalted or bland aconite slices). Yan Fu Zi is made by selecting large, full roots of nifuzi, then soaking them overnight in a solution of mineral salts. Next, it is continually soaked in salt water and the roots are taken out each day to dry before being re-soaked in the salt water. This gradually prolongs the drying time. When the product is finished, it is firm and covered in salt crystals. At this stage, the item is still numbing to the tongue.

Dan Fu Pian: Dan Fu Pian, desalted or “bland” Fu Zi, is made by soaking Yan Fu Zi in clear water until the salt is removed; the water is changed 2-3 times per day during this process. Next, the Fu Zi is decocted with licorice and black beans until the core is reached and slices of the Fu Zi no longer numb the tongue. Then the licorice and black beans are removed and the Fu Zi is sliced into pieces and sieved clean. For every 100 kg of Yan Fu Zi, 5 kg of licorice and 10 kg of black beans are used. This form is considered to be best for treating yang desertion.

Hei Shun Pian: Hei Shun Pian is made by grading nifuzi pieces based on size, then washing the pieces and soaking them for several days in a solution of mineral salts. After soaking for several days, the roots are boiled thoroughly and then taken out and rinsed. The roots are then sliced into thin slices (0.5cm thick) and are then soaked again in water. The product can then be stained to the color of concentrated tea, and it is then steamed until it has an oily, lustrous appearance. Then it is oven-dried until half-dry, and either finished with oven-drying or air-drying. Hei Shun Pian is the most commonly-used form of Fu Zi, and it also tends to have the lowest toxicity.
**Bai Fu Pian:** Bai Fu Pian appears white because it has the black skin removed. It is made by taking washed pieces of *nifuzi* of uniform size and soaking them in a mineral salt solution for several days. It is boiled thoroughly in the mineral salt solution until the core is reached, and then it is taken out and its outer skin is manually removed. It is then sliced into thin slices (0.3cm thick) before being soaked in water, removed, and steamed. Next it is sun-dried, and sulfur is sometimes used when it is halfway dried.

**Pao Fu Pian** is made by stir-frying either Hei Shun Pian or Bai Fu Pian in hot sand at high heat until the Fu Zi slices puff up and change color. A similar product, often sold under the trade name *Pao Tian Xiong*, is made by baking whole, peeled pieces of Fu Zi until they puff up and change color. These forms are considered to be best for warming the kidney.

**References:**

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