

# Wu Wei Zi (五味子)

## Uncovering New Uses for Superior Health

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### Name, Taste, and Appearance

The name Wu Wei Zi appears to convey a straightforward meaning: five flavor fruit. The term *zi* usually indicates small round or oblong fruits, such as lycium fruits (Gou Qi Zi) and mulberry fruits (Sang Zi), or seeds, such as cuscuta seeds (Tu Si Zi) and perilla seeds (Zi Su Zi). Since there are five basic tastes of Chinese medicine (plus bland), each of which is associated with a certain therapeutic activity, the name “five flavors” (or “five tastes”) could simply suggest that the fruit is flavorful and has multiple medicinal actions rather than five actual tastes. This is probably the case here; in the *Shen Nong Ben Cao Jing*, the first place of its mention, only the sour taste is attributed to Wu Wei Zi. An oft repeated Chinese tradition recorded much later in the *Ben Cao Bei Yao* (by Wang An, ca 1680) holds that the five tastes can be found in the fruit parts this way: “The outer skin is sweet, the flesh is sour, the kernel is pungent and bitter, the whole fruit is salty.” However, this description is poetic rather than fully realistic. The salty taste is provided primarily by sodium, but these fruits barely contain sodium; their potassium content is relatively high, and this can be a contributor to a mild salty taste, but unlikely to be distinguishable in this strong tasting fruit. The other tastes are explained by known constituents: sugars, mostly in the form of glucose and fructose, provide the sweet taste (but these are mainly in the flesh rather than the skin and not especially high in amount); organic acids, such as fumaric, citric, malic, tartaric, and succinic, provide the sour taste (a dominant flavor, in the flesh and skin); lignans, primarily found in the seeds, provide the bitter taste; and essential oils provide the pungent taste (there are several volatile compounds in differing amounts among the different parts, a substantial portion is in the seeds), which are detectable in the taste of the fruits and their extracts. The TCM Wiki, an online resource for Chinese herb information that is generally reliable, has a brief section titled “actual smell and taste” stating: “light smell, sour in flavor, after breaking seed, fragrant, bitter, and pungent.” That the seed tastes bitter and pungent with release a fragrance *after breaking* fits the tradition and corresponds with the science that points to primary seed constituents of bitter lignans and pungent, aromatic oils, retained within a tough seed coat. In this fruit as a whole, the sour taste is evident, especially upon decocting, and hence the herb is classified with the astringents. The salty and sweet tastes mentioned for the fruit are rightly dismissed in any rendition of what is actually perceived. The aromatics provide a cedar-like woody taste and fragrance, especially due to the major component muurolene, as well as others that are also found in cedars.

The botanical name is *Schisandra chinensis*. Based on pronunciation, the common name has often been rendered as schizandra and this spelling is usually found in designations of its active components, schizandrins. *S. chinensis* is designated as northern schizandra (Bei Wu Wei Zi); there is also a central-southern China variety, *S. sphenanthera* (Hua Zhong Wu Wei Zi, sometimes called Nan Wu Wei Zi) which is of less demand and had been infrequently the target of studies until recently, now spurred as a means of developing this secondary resource. A related herb, *Kadsura longepedunculata*, is used similarly but infrequently, from the south of China, and dubbed Nan Wu Wei Zi. In the following description, Wu Wei Zi will refer to the northern variety.

The plant is a vine, though when growing apart from trees for attachment points, it appears as a shrub. The fruits arise in “droops” that look somewhat like bunches of small grapes. The fresh fruits have a plump, bright red, spherical to slightly oblong appearance; when dried, the fruits are a dark red to purplish color with small, hard, shriveled form. With the strong sour taste of the fruits, they have not entered the realm of foods, not even as jams, as the aromatics are overpowering. Wu Wei Zi is provided direct to consumers as crude dried fruits, teas to be made with boiled water, bottled tea ready to drink, alcohol extracts, and fermented extracts.

## Growing Region

Wu Wei Zi is found in the northeast mountainous region of China, such as the Changbai Mountain range, which is included within the provinces of Heilongjiang, Jilin, and Liaoning (and into North Korea); these mountains are also an area well known for cultivation of ginseng. While this locale remains the primary



source for schizandra fruit, the plant is not limited to this area, and occurs to some extent in Hebei, Inner Mongolia, and Shanxi as well as in northern Japan and in the far eastern part of Russia. Estimated annual production of the dried fruits from both wild sources and cultivation in China is 2,000 tons. There is a good supply available; the plants grow freely in the mountains and are planted in fields; each vine yields substantial quantities of fruits. Yet, as recently as the 2016 harvest season, there was a shortage compared to demand and the price was reported to increase dramatically as a result. A warehouse fire where schizandra and ginseng were being stored further impacted the supply situation soon after.

## Wu Wei Zi in TCM Literature

Formal recognition of the value of Wu Wei Zi can be traced back to the Eastern Han Dynasty period (25-200 A.D.). The earliest preserved record of Chinese herbal medicine comes from the Mawang Dui archeological site (early Western Han Dynasty; ca 168 B.C.), and Wu Wei Zi is not mentioned there. In the *Shen Nong Ben Cao Jing* of about 100 A.D. the uses of the herb are briefly listed: “boosts the qi, [treating] cough and counterflow of qi [up-rushing qi], taxation damage, and languor and emaciation. It supplements insufficiency, fortifies yin, and boosts male’s essence.” This description points to Wu Wei Zi as a tonic, especially to be used for weakened patients with cough. The trio of supplementing, fortifying, and boosting (as rendered in this translation) is the underpinning of the herb’s broader use to be described here, elaborated further by modern investigations revealing neurologic actions and liver protection.

The first formulas with Wu Wei Zi are in the *Shang Han Lun* and *Jin Gui Yao Lue*, dated to around 200 A.D., where the fruit is utilized in formulas for cough. The single prescription with Wu Wei Zi in *Shang Han Lun* is the one best known: Xiao Qing Long Tang (Minor Blue Dragon Combination). As fits the concept of this herb having astringing and tonifying effect, its inclusion in a formula for moist cough in a deficiency patient is readily understood.

Xiao Qing Long Tang is repeated in the companion volume *Jin Gui Yao Lue*, where Wu Wei Zi is additionally included in formulas in two chapters on lung diseases (chapters 7 and 12). In each case, Wu Wei Zi is a secondary ingredient in a large formula; it can be deemed secondary not only by virtue of being a minor proportion of the formulas, but also because there are other formulas of similar nature in these texts without it. The dose used in each formula is ½ sheng, that being a measure of volume, probably 6-9 grams by weight.

The herb remained relatively insignificant apart from treating cough until it was popularized during the Tang Dynasty, more broadly used as a tonic for weakness and an astringent for night sweating; it was also given for enhancing male fertility. Formulas with Wu Wei Zi entered into the valued compendium of herb formulas known as the *Tai Ping Hui Min He Ji Ju Fang* (or, shortened, as the *He Ji Ju Fang*; published around 1100 A.D., early Song Dynasty). Most of the formulas of that text came from the Tang period.

By the time of the *Ben Cao Gang Mu* at the end of the 16<sup>th</sup> century, the status of Wu Wei Zi had been elevated through a gradual process, having been included in a few important combinations that were retained as significant reference formulas. The small formula Sheng Mai San (originally presented in a 13<sup>th</sup> century text) is relayed there. It is comprised of Ren Shen, Mai Men Dong, and Wu Wei Zi; Ren Shen is considered the

lead herb, Mai Men Dong the assistant, and then Wu Wei Zi is added to the foundational pair. Here, its function is described as being to “stimulate the formation of essence in the kidneys and to reaccumulate lost influences [qi].” The idea of capturing lost qi is consistent with the concept of an astringent, especially one that affects the kidney; the sour fruit Shan Zhu Yu is used for the same purpose and more commonly so. Formation of essence is a different function; this role for the fruit may have been manifest most often by making an alcohol extract of schizandra to be taken as a sexual tonic.

The use of Wu Wei Zi to generate essence was epitomized in a formula of the *Ju Fang Fa Hui*, a 14<sup>th</sup> century medical work. This is Wu Zi Yan Zhong Wan, or the pill of five “seeds” (zi) to restore original essence, though Chinese translations point to its use to increase male fertility. It is comprised of five herbs designated “zi”: Wu Wei Zi, Gou Ji Zi, Che Qian Zi, Tu Si Zi, and Fu Pen Zi and is suggested to be a modification of a seven seed formula from Sun Si Miao of the Tang Dynasty. These fruits and seeds were to be ground to powder and made into pills with honey. All five are deemed astringents and tonics. Centuries later, in the *Jing Yue Quan Shu*, a 17<sup>th</sup> century text, there is a decoction formula that is an expansion of *Sheng Mai San*, using the original three herbs and then adding Huang Qi and Gan Cao. It is used especially for replenishing heart qi. The pair of Mai Men Dong and Wu Wei Zi found in the *Sheng Mai San* formulations was added to Liu Wei Di Huang Wan, the best known kidney yin tonic, to yield Mai Wei Di Huang Wan, which is used to nourish deficiency of kidney and lung. These three base formulas are among the few examples of those which are usually studied by students of TCM today with Wu Wei Zi used as part of a primary tonification strategy.

### **Modern Efforts**

In the modern era, this fruit has been subjected to considerable research to define active constituents, pharmacological properties, and some new clinical applications. Despite encouraging results, Wu Wei Zi is likely underutilized by practitioners of Chinese medicine outside of China. By classification, it is an astringent, and by typical formula use, it is for cough. These valuable uses do not make a very convincing image of a key herb for enhancing health, mental performance, and longevity, applications that are among those developed beyond the tradition by modern research efforts. Some promotional activities, largely directed to consumers, provide excessive claims while still reflecting an underlying known therapeutic benefit.

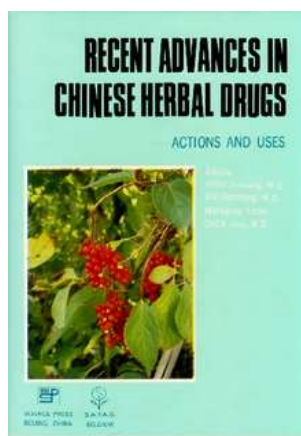
A few years after the 1949 Chinese revolution, research projects were established in all the Chinese provinces to utilize modern science methods for the purpose of confirming the value of traditional Chinese medicine (TCM) and exploiting natural resources by encouraging broader use of the herbs. Numerous journals were initiated to convey the findings, and some books were generated to summarize selected articles from the vast number of the published reports, mainly from the research done during the 1950s through 1980s. Two journals were produced in English language versions, *Journal of Traditional Chinese Medicine* and *Journal of Integrated Chinese and Western Medicine*, and for a while an abstract service in Hong Kong also published information in English (*Abstracts of Chinese Medicine*; a few invited review articles were also provided in some volumes, including one on schizandra active constituents in 1989); all of these information services started up in the 1980s. During the past twenty years, an increasing range of Chinese medicine journal articles have made their way to the PubMed site launched in 1997 that collects abstracts with links to full articles (most of which require a fee for viewing but some provided free). The abstracts are in English. Much of the research on Wu Wei Zi had focused on anti-oxidant activity, liver protective effects, and an impact on “stress,” as can be seen through an examination of these information resources.

In the U.S., Chinese herbs became a subject of considerable interest in the early 1980s, following the gradual opening of China to the west a few years earlier. Since I was involved in some of the introductory effort for this herbal tradition, establishing the Institute for Traditional Medicine in 1979, I can also mention my own work with schizandra for applications beyond cough and astringency to illustrate the influence of modern research. This effort had started for me with investigation of Wu Zi Yan Zhong Wan which had been mentioned in an early English language book from the U.S.: *Chinese Herbal* by T.Y. Pang (1982). This text briefly relayed only a few formulas and this one was under the name Wu Zi Bu Shen Wan, where Wu Wei Zi was a minor component (4.3%). The formulation pointed to one of the common methods used by herbalists

to develop formulas for broad use: it was comprised of herbs having similar characteristics—astrigent seeds/fruits—as opposed to a complex formulation strategy to target a syndrome. By using herbs of a certain botanical nature, the formula provided a relatively large quantity of specific types of plant constituents that could reinforce the effects of each of the ingredients.

An especially important influence on my work came from the summary reports on selected herbs in a two volume set: *Pharmacology and Applications of Chinese Materia Medica* (1986, 1987). This source included an eight page monograph on Wu Wei Zi plus two and a half pages of references from journal articles published 1954-1977, making it one of the largest presentations of any of the herbs in this book (not surprisingly, the largest monograph was for Ren Shen, with twelve pages of summary and nearly three pages of references).

The *Pharmacology and Applications* monograph begins with an analysis of chemical constituents. As occurs in many plants, schizandra contains volatile oils, including several commonly occurring monoterpenes, and dominated by sesquiterpenes, such as chamigrene and himachalene, occurring in relatively few plants and a contributor to the unique taste of the fruits; some of these sesquiterpenes are found in cedars, especially juniper. Another major constituent group is lignans; these are designated schizandrins. Lignans are most often found in seeds; dietary sources of lignans include flax seed, sesame seed, sunflower seed, pumpkin seed, etc., but the lignans of Wu Wei Zi seeds are structurally unique and exclusive to the Magnolia Family of plants.



In the pharmacology section on schizandra, there were two main divisions, one about the effect on the brain and the other about effects on the liver, in the latter case, protecting against hepatic damage, with the effect of lowering liver enzymes detected in the blood that are released during liver damage, such as by viral hepatitis.

This hepatic application of Wu Wei Zi was the featured chapter in a 1991 book on Chinese herbal research, for which an image of *Schisandra chinensis* appears on the dust jacket (left). The Institute for Traditional Medicine pursued the use of Wu Wei Zi for liver disease with a project headed up by the U.S. Centers for Disease Control and carried out in China in 1995-1996 with good response. Background research for this trial resulted in development of a seven herb formula called “Salvia-Ligustrum” that includes the pair of fruits Nu Zhen Zi and Wu Wei Zi, which not only have liver benefitting effects, but also are used in other contexts as an “anti-aging” pair.

The brain effects of Wu Wei Zi were the most interesting. I will quote here from that portion of *Pharmacology and Applications* to illustrate the unique nature of the reports. Because the descriptions are terse and the language technical and perhaps slightly outdated compared to current descriptions, I have edited out some material and here underline a few words to focus attention on what the primary conclusions are.

Studies on the conditioned reflex proved that the oral dose [of Wu Wei Zi] first acted on the cerebrocortical inhibitory mechanism, strengthening and centralizing the process so that positive induction was induced. This action resulted in improved differentiation and in the balance between the excitatory and inhibitory control mechanisms of the cerebral cortex....

Wu Wei Zi promoted the normalization of the nervous activity in dogs with neurasthenic syndrome....

Electroencephalographic synchronization experiments proved that Wu Wei Zi had a significant effect on the flash synchronization of the cerebral cortex of the rabbit, as evidenced by the appearance of both fast and slow flash rhythms, i.e., expansion of the range of synchronization in two directions. It is believed that the above phenomenon results only when there is a strengthening and reciprocal induction of the stimulation and inhibition control mechanisms of the cerebral cortex, causing the adaptability of the superior force and the promotion of the alterations of the control mechanism. Wu Wei Zi could also normalize the electroencephalographic waves of fatigued rabbits....

Human intellectual activity can be enhanced by Wu Wei Zi so that work efficiency is increased. Schizandrin at 5-10 mg could improve certain activities requiring concentration, fine coordination, sensitivity and endurance, as demonstrated in healthy young male adults...The herb could improve vision, enlarge the visual field, improve the visual field, improve hearing power, and increase the discriminating ability of skin receptors...

One can wonder why all the detailed studies of the cerebral cortex were undertaken. This focus was partly due to the fact that traditional practitioners at the time considered the herb to improve memory and help treat insomnia. The traditional view is that the brain is an extension of the kidney; Wu Wei Zi was long depicted as boosting kidney essence, so the finding of valuable effects on the brain would seem to make sense in supporting the ancient tradition. In the Recent Advances book, it was stated “In the 1950’s, it was reported that an extract of the dried fruit had a stimulatory action on the central nervous system and enhanced the mental and physical capacities of humans.” The stimulatory action is not, however, agitational (increasing alertness), as one may think of stimulants; rather, Wu Wei Zi stimulates a cerebral activity where it is deficient, the deficiency causing disorganization of the normal activities. A similar problem occurs in attention deficit disorder, with wandering mind, and sometimes with hyperactivity; the drug therapy approach is to use a stimulant that corrects a particular area of inadequate brain activation. Schizandra yields a coordinated brain function that is ultimately calming, but not directly sedating, so that it could be taken any time of day. It does not interfere with, for example, operation of heavy equipment as could be the case with sedating agents. A key term in the above quotation is “synchronization” indicating a strengthening and normalization.

The researchers had found that the main central nervous system effect of Wu Wei Zi was in the seed; the active components are especially soluble in alcohol. Crushing the seeds when making the powdered herb and/or extracting with alcohol provides a better effect on the brain function than taking the whole fruit and extracting by hot water. For both the hepatic protective activity and brain activity, the crushed seeds, whether put into pills or extracted, were found to be the most effective part. Removing the seed from the hardened sour fruit covering and biting into it produces an initial pungent taste of the oils and then a lasting bitter taste from the lignans. Whole fruit decoctions need to be consumed in fairly large quantities because of the hard seed coat; hot water can gradually push out most ingredients over the decoction time. Factories producing Wu Wei Zi syrups and dried extracts tended to leave behind much of the lignan content in the residue.

Another influence on Chinese investigation of brain effects of Wu Wei Zi was research being conducted in Russia, some of which contributed to the above review. Russian researchers had taken a particularly strong interest in the brain and neurological network to see how to improve its function, and also to help with recovery from neural injury. Some of this research effort, starting in the 1950s, reflected the fierce competition with America. The Soviets intended to excel in Olympic competitions, in medicine, and in military ventures; enhanced mental function was sought toward attaining the goals of this broader endeavor.



One result of the Chinese investigations was that several patent medicine manufacturers made brain nourishing pills (bu nao; bu = to supplement; nao = brain), at least one of which was described in English as Cerebral Tonic Pills, with Wu Wei Zi as a central ingredient. In my own work, I had designed an herb formula for an American manufacturer which I dubbed “Schizandra Dreams;” although it has since been substantially reformulated, the tablet still contains Wu Wei Zi. Another formula for sleep, utilizing western and Chinese approaches, I called Melazandra, named for two of the key ingredients, melatonin, a nutrient hormone that is widely used in the west, and schizandra extract. I designed two formulations for brain function benefit, one keeping the name Bu Nao Wan, imitating “Cerebral Tonic Pills” but with a somewhat higher schizandra proportion, and Zizyphus 18, in which the Wu Wei Zi proportion is second only to Suan Zao Ren (zizyphus seed, which is also present as a main ingredient in

Melazandra). Inclusion of Wu Wei Zi in Zizyphus 18 reflects its use in the traditional formula Tian Wang Bu Xin Dan, indicated for heart yin and blood deficiency, but its proportion was increased.

The Russian research mentioned above led to an evaluation of herbs that were deemed “adaptogens.” These herbs helped to maintain homeostasis under stress and could increase endurance and mental focus. Among them were schizandra, eleuthero (Ci Wu Jia), and rhodiola (Hong Jing Tian). Several companies have produced formulations with these herbs, thus making schizandra widely available, usually provided direct to consumers rather than via prescription by Chinese medicine practitioners. The earliest combination came from the Swedish Herbal Institute, founded in 1975. The original formulation had eleuthero and schizandra, the product known as Chisan; the formulation with rhodiola added was called Adapt-232, still provided today.

In China, this work led to investigations of herbs potentially useful for treating stress-induced debility, translated often as neurasthenia (literally, weakened nerves). In the mid-1980s, I had identified eight herbs that seemed especially promising for this effect, utilizing several ingredients also considered beneficial for immune enhancing activity, and designed a formula with them called Astragalus Eight Herb Formula (it had been produced as “Astra 8,” since then reformulated), and Wu Wei Zi was one of those ingredients. Based on the same intended application, schizandra has been included in other tonification formulations I designed.

Medicinal fruits are an important aspect of Chinese medicine, and they are often utilized as single herbs or in small formulas to promote health, improve skin, and enhance eyesight. The eyesight effects were mentioned for Wu Wei Zi in the Pharmacology and Applications monograph. A formulation of seven fruits, including Wu Wei Zi and Gou Qi Zi (lycium), called Rare Fruits Blend, was made available for these uses (“rare” had the meaning of valuable and not one of the main food staples). A simple formulation of schizandra with lycium is also a popular tonic in China; an American version by Dragon Herbs is Goji and Schizandra drops (alcohol extract) suggested for healthy aging, radiant beauty, memory and cognition, eye and skin support.

The formula names are provided here solely to illustrate some ways schizandra has been utilized in modern applications. Many Chinese medicine practitioners may not think of this herb as important to performance, but I have here illustrated how it has been incorporated into formulations for such uses.

Perhaps useful as an aside, Hu Shiuying describes in her book Food Plants of China an incident where someone seeking identification of a sample of the schizandra fruits intended for a personal use came to the Harvard University Herbaria where Hu had been working. She asked the visitor what its use was here in the U.S. He relayed “people in [the] horse racing business use the material to feed their horses before the race.”

### **The “Secret(s)” to Schizandra**

The key elements for getting outstanding results with Wu Wei Zi are: formula context, herbal proportion, and total dosage. When used, for example, as an ingredient in the context of a complex formula for cough or for basic astringency (e.g. diarrhea, sweating, urinary frequency), the role of schizandra is primarily as a sour herb, a source of organic acids that can assist in alleviating these symptoms. Schizandra, like certain other sour astringents, such as Wu Mei, Shan Zhu Yu, and He Zi, has considerable sourness, so that it can be used in relatively small proportion. The total dosage of the formula, when there are a large number of diverse ingredients, has to be high so as to get the different therapeutic contributions of the various herbs. As an example, a formula for cough may include antitussive herbs (calm coughing, e.g., Ku Xing Ren), herbs for resolving phlegm (e.g., Ban Xia), herbs for clearing heat or warming cold (e.g., Huang Qin or Gui Zhi), tonics for weak qi (e.g., Huang Qi), etc. By contrast, in a formula with two or more sour fruits, such as Wu Wei Zi plus He Zi, the total dosage may be somewhat less, because of the additive effect of the sour ingredients.

One way to elaborate formula context is the pairing of schizandra with one or two other herbs, to yield an improved therapeutic effect. Among the important pairings are these:

#### **Seed Combinations**

The Age Defier: Wu Wei Zi with Nü Zhen Zi

The Kidney Astringer: Wu Wei Zi with Tu Si Zi

The Brain Calmer: Wu Wei Zi with Suan Zao Ren and Bai Zi Ren

### Fruit Combinations

The Brightener: Wu Wei Zi with Gou Qi Zi

The Smoother: Wu Wei Zi with Sang Zi

The Intestinal Astringer: Wu Wei Zi with Fu Pen Zi

### Traditional Tonic Combinations

The Strengthenener: Wu Wei Zi with Ren Shen

The Essence Tonifier: Wu Wei Zi with Mai Men Dong

The Qi Settler: Wu Wei Zi with Fu Ling and Gan Cao

### Modern Combinations

The Adapter: Wu Wei Zi with Ci Wu Jia and Hong Jing Tian

The Immune Tonifier: Wu Wei Zi with Huang Qi

The Cardiac Booster: Wu Wei Zi with Ling Zhi plus Feng Ru (royal jelly)

In terms of proportions, because of the extreme sour taste, the proportion of Wu Wei Zi is usually on the low side and this is true of other highly sour fruits, such as Wu Mei. As an adjunctive herb, it can be present as little as 5-7% of a formulation; for activity as a primary herb, 8-15%. But, for the substantial effects on brain function and for immediate effects on performance, it should be used in proportions greater than 15%. It can be used as a single herb, though that is not a common practice, since one or two other herbs can direct its action to a particular application.

Total formula dosage is one of the areas where patients and practitioners often fail to generate the best results. There may be a well-designed herbal combination with Wu Wei Zi at a suitable proportion, but the total formula dosage recommended or reduced amount actually consumed despite recommendations, is frequently too low.

The quantities depend on form of the herbs, such as powders, extracts, or traditional style decoctions. Generally, the decoction range for schizandra is 3-15 grams dried fruit per daily dose, with the lower amount (3-6 grams) for astringent effect or as an adjunct to other herbs that share a similar activity and the higher dose (12-15 grams) for the impact on mental function and performance. These days, few people outside of China are using decoctions, and even in China, the trend is shifting to prepared forms. Some of the preparations have the advantage of concentrating the ingredients of the fruits into a small volume, thus allowing for practical application with reasonable dosing.

One of the commonly used forms is the dried hot water extract, referred to often as granules because of the usual granulated finished product, which is either in loose form or encapsulated. Although the amount of extract in the granules is not usually revealed, nor its extract ratio (amount of crude herb divided by amount of extract that results from basic processing), it is common to rate the granules as "5:1". Thus, to get the 12-15 grams of dried fruit in decoction, the equivalent would be about 3 grams. Compared to common recommendations, this is a large amount; this larger amount generates the desired effects on performance.

Perhaps the most important secret is this: for the performance enhancing properties, both physical and mental, the primary active constituents are in the seeds. There is usually one kidney shaped seed in each fruit (occasionally two). As mentioned above, the seeds have a hard coat on them. Efforts to cultivate plants from the seeds are often unsuccessful because of the difficulty getting the seed coat to breakdown. When boiling the fruits to make a decoction, the seeds eventually release their content, but if the cooking conditions and duration are insufficient, there is a fair amount left behind. Prolonged boiling, though releasing these ingredients, may harm the content of other herbs boiled together to make the formula or evaporate essential oils. Grinding the herb to fine powder to be ingested directly or briefly boiling the powder tends to work better. Hot alcohol extraction may help, though many alcohol preparations are carried out without heating. Regardless of the preparation method, to get the desired results, a sufficient amount of the active ingredients need to be consumed. Thus, the quantity of the ingested material required might be rather high. The seed

content of lignans is around 10% but varies widely depending upon the plants' growing circumstances and the maturity of the fruit when picked. The rest of the fruit, and other plant parts, such as leaves and stems, contain valuable active components as well, but the lignans and essential oil of the seeds are especially important to the intended application of improved performance, better sleep, and protection of internal organs from damage due to chemical, viruses, and inflammatory processes. Investigation of the seeds of Wu Wei Zi rather than focus on the whole fruit was initiated by Russian investigators in the 1950s and though the seed research has continued to some extent since then, commercial preparations from the seeds are still not available.



Fruit ready for harvest (upper left), dried fruits (upper right), chemical structure of schizandrin, a lignan (right)

