

Pharmacological Research and Clinical Application Progress of *Cnidium monnieri*

Qianyu Luo

Shanghai Jian Qiao University, Shanghai 201306, China

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Abstract: *Cnidium monnieri* (She Chuang Zi) is a traditional Chinese medicine with wide clinical applications. It is the dried mature fruit of the *Cnidium monnieri* (L.) Cuss. plant from the Apiaceae family. This article discusses the source, efficacy, and indications, usage and dosage, historical application, chemical constituents, pharmacological research, clinical applications, and adverse reactions of *Cnidium monnieri*.

Keywords: *Cnidium monnieri*; Pharmacological research; Clinical application

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1. Introduction

Cnidium monnieri is a commonly used Chinese medicinal herb in daily practice. According to the 2020 edition of the Chinese Pharmacopoeia, its aliases include Wild Fennel, Wild Carrot Seed, Snake Rice, and Snake Millet. *Cnidium monnieri* is the dried mature fruit of *Cnidium monnieri* (L.) Cuss. (Apiaceae). Its properties and flavors are pungent, bitter, and warm; it has minor toxicity. It enters the kidney meridian. It warms the kidney and strengthens yang, dries dampness, dispels wind, and kills parasites. The Chinese Pharmacopoeia records its main uses for male impotence, female uterine coldness, cold-damp leukorrhea, damp-bi lumbar pain; external use for external genital eczema, female vulvar itching; trichomonal vaginitis. Its production areas are distributed throughout China, including Jiangsu, Anhui, Guangdong, Liaoning, Guangxi, and other provinces, often found on mountain roadsides, fields, low mountain slopes, and wetlands. The earliest recorded application of *Cnidium monnieri* is found in the *Shennong Bencao Jing* (Divine Farmer's Materia Medica), which records its use for swelling and pain in the female genitals, male impotence, and damp itching leukorrhea. The *Rihuazi Bencao* (Materia Medica of Rihuazi) records its use for treating damp scrotal sweating and tinea, stubborn numbness of the limbs, red and white leukorrhea, and reducing urination frequency^[1]. From this, it can be seen that *Cnidium monnieri* has a long history of application, and its usage recorded in classical ancient texts is primarily for external use.

2. Usage and dosage

Reviewing classical famous formulae involving *Cnidium monnieri* throughout history and the treatment experiences of modern renowned physicians reveals that the common dosage of *Cnidium monnieri* is generally 12–15 grams. In decoctions, it is 9–15 grams; for external use, it is 1.242–50 grams; and in pill and powder formulations, the dosage is 0.06–0.69 grams^[2]. When used clinically, the dosage of *Cnidium monnieri* should be adjusted appropriately based on pattern differentiation.

3. Chemical constituents

Modern research indicates that *Cnidium monnieri* mainly contains natural coumarins, linear furanocoumarins, angular furanocoumarins, chromones, and other components. Modern pharmacological studies have found that *Cnidium monnieri* possesses pharmacological effects such as anti-tumor, vascular protection, anti-platelet aggregation, anti-arrhythmia, memory improvement, anti-osteoporosis, lipid-lowering, anti-allergy, anti-inflammatory, antibacterial, and antipruritic actions^[3].

4. Pharmacological effects

The main active component of *Cnidium monnieri* is osthole. Osthole, also known as methoxypsoralen, belongs to the coumarin class of compounds^[3]. Studies show that it has significant therapeutic effects on the cardiovascular and cerebrovascular systems, nervous system, endocrine system, joint diseases, etc.

4.1. Cardiovascular and cerebrovascular systems

Cardiovascular and cerebrovascular diseases are very common conditions, predominantly affecting middle-aged and elderly populations. They have high incidence rates, high recurrence rates, and numerous complications. Due to limitations in the specificity of drugs for treating cardiovascular diseases, the chance of a cure is relatively low. Osthole has effects such as enhancing immune function, antibacterial activity, lowering blood pressure, and anti-arrhythmia. It has a certain effect on cardiovascular and cerebrovascular diseases. Liu *et al.*^[4] established a rat model of acute myocardial infarction to investigate the effects of osthole on cardiac function and the myocardial tissue levels of matrix metalloproteinase-2 (MMP-2) and phosphorylated extracellular signal-regulated kinase (P-ERK). The experimental results indicated that osthole significantly improved cardiac function in the acute myocardial infarction model rats and reduced myocardial inflammation and oxidative stress in rats with myocardial infarction.

4.2. Nervous system

Nervous system diseases primarily involve impaired neurological function, or disorders of sensation, consciousness, or movement. Diagnosis typically relies on brain CT and MRI to find the cause. Osthole has sedative, analgesic, anti-Parkinson's, anticonvulsant, anti-ischemic brain injury, and anti-dementia effects. Jiang *et al.*^[5], through establishing a rat model of nucleus pulposus-induced inflammatory radicular pain, found that osthole could improve pain sensitivity in these rats and inhibit inflammatory reactions. Its mechanism of action may be related to participating in the inhibition of the ERK/MAPK pathway signaling in the spinal dorsal horn.

4.3. Endocrine system

The endocrine system affects the body's internal environment, influencing growth, development, environmental adaptability, and stress response capacity. Endocrine system diseases refer to disorders in the hormone-secreting function of glands performing endocrine actions, also known as "endocrine disorders." Huangfu *et al.* [6] applied different concentrations of osthole to ovarian cancer SKOV3 cells and found that osthole could inhibit the proliferation of SKOV3 cells and induce their apoptosis. Wang *et al.* [7] observed the effects of osthole on the activity and apoptosis of cervical cancer HeLa S3 cells, using the MTT method to detect cell proliferation. They found that osthole could inhibit the proliferation of cervical cancer HeLa S3 cells and induce apoptosis, potentially through mechanisms related to upregulating pro-apoptotic proteins and downregulating anti-apoptotic protein expression.

4.4. Bone and joint diseases

Some studies indicate that Zhang [8] reported that osthole has the effect of regulating bone metabolism, promoting bone formation, and inhibiting bone resorption. Furthermore, osthole can inhibit osteoclast bone resorption activity, promote osteoblast differentiation and maturation, and improve bone structure. Duan *et al.* [9], by establishing a rat model of knee osteoarthritis and using controlled experiments, found that osthole could improve symptoms in the knee osteoarthritis model rats.

5. Clinical applications

The clinical application of *Cnidium monnieri* is primarily external, mainly used for kidney deficiency, gynecological, and skin diseases. Although there is much research on osthole, there are relatively few products that have been put into clinical application. *Cnidium monnieri* is more commonly found in gynecological washes and suppositories for treating vaginitis. Since vulvar itching often belongs to the category of leukorrhea problems, mostly related to damp-heat, fumigation and washing with *Cnidium monnieri* has a direct effect, good targeting, and can produce positive results relatively quickly. Additionally, *Cnidium monnieri* is also used for skin diseases such as eczema, scabies, and skin itching. In the treatment of kidney diseases, it is mainly used through pattern differentiation treatment and formula combination, showing relatively good therapeutic effects for various types of kidney deficiency patterns, such as spleen-kidney yang deficiency and qi-yin deficiency.

6. Adverse reactions

The safe dosage range for *Cnidium monnieri* is relatively wide, and no significant toxic side effects are seen at normal doses (9–15 g). However, attention should be paid to its adverse reactions. Literature reports: after decocting and taking 20 g of *Cnidium monnieri*, adverse reactions such as tongue numbness, nausea, and vomiting occurred. This shows that *Cnidium monnieri* should not be used in large doses. When using *Cnidium monnieri*, its compatibility contraindications and adverse reactions should be noted. For example, it is contraindicated in those with yin deficiency with fire effulgence or damp-heat in the lower jiao, and treatment must be based on pattern differentiation. Furthermore, it should not be used concurrently with "Moutan Cortex (Mudanpi), Croton Seed (Badou), and *Fritillaria* (Beimu)."

7. Conclusion

Cnidium monnieri has a long history of application, with relevant records found in medical classics. *Cnidium monnieri* has anti-inflammatory, anti-allergic, anti-tumor, anti-osteoporosis, anti-arrhythmia, sedative, and anticonvulsant effects. Clinically, it is used mainly externally, primarily for itching relief and parasite killing. The main bioactive component of *Cnidium monnieri* is osthole. Numerous pharmacological studies have been conducted on *Cnidium monnieri*, but the specific mechanisms of action still need further research and clarification. The research on *Cnidium monnieri* requires further in-depth exploration by researchers. Overall, the study of *Cnidium monnieri* requires our continuous exploration and effort.

Disclosure statement

The author declares no conflict of interest.

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