

Acorus tatarinowii Schott

Subjects: Medicine, Research & Experimental

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Acorus tatarinowii Schott (*A. tatarinowii*) is a natural medicinal plant. It plays an indispensable role in the treatment of diseases by the empirical medicine system and has achieved remarkable curative effects.

Keywords: *Acorus tatarinowii* Schott ; botany ; traditional uses

1. Introduction

Acorus tatarinowii Schott. (*A. tatarinowii*) is a common perennial herbaceous plant ^[1]. It is mainly distributed from northern temperate to subtropical regions, especially in China, Japan, India, Thailand, and Korea ^[2]. *A. tatarinowii* is one of the most widely distributed and frequently used natural medicinal plants from the genus *Acorus* and has a long documented history of medicinal use in the empirical medical system. *A. tatarinowii* first appeared as a traditional Chinese medicine (TCM) in the earliest Chinese medicinal classic work Shennong's Classic of Materia Medica (written more than 2000 years ago during the Han Dynasty). It is widely used in folk medicine for treating complex and difficult ailments as well as some serious diseases and has achieved remarkable therapeutic effects. It was included for the first time in the 1963 edition of the Pharmacopoeia of the People's Republic of China ^[3] as a TCM in clinical use and was continuously included until the latest 2020 edition ^[4]. Dried rhizomes are the main *A. tatarinowii* medicinal parts, and these have been commonly used alone or combined with other TCM in China to treat stroke, dementia, depression, seizure, and mental disorders for centuries ^[5]. Many Chinese medicinal formulae containing *A. tatarinowii* have been widely used in clinical practice. At the same time, many commercial Chinese patented medicinal products containing *A. tatarinowii* are circulating in the market to treat specific diseases. Moreover, certain active ingredients are extracted from *A. tatarinowii* as pharmaceutical raw materials ^[6]. As a medicinal plant, *A. tatarinowii* has significantly contributed to people's health and the traditional medical systems.

Over the past few decades, *A. tatarinowii* has attracted increasing interest as an important medicinal plant from both researchers in natural medicine and pharmaceutical institutions. Significant progress in the isolation and identification of *A. tatarinowii* active constituents has been made. *A. tatarinowii* contains many phytochemical components with diverse structures and different activities. Thus far, more than 160 components have been identified and characterized. They mainly include phenylpropanoids, terpenoids, lignans, flavonoids, alkaloids, amides, organic acids, and others. Modern pharmacological studies have shown that these chemical components have potent properties, such as antidepressant, antiepileptic, anticonvulsant, antianxiety, antifatigue, and antifungal properties, and they have been shown to improve Alzheimer's disease (AD) ^{[7][8]}. It is worth noting that *A. tatarinowii* has shown potent neuroprotective effects. *A. tatarinowii* can reduce brain nerve injury by regulating neurotransmitter levels and improving blood circulation in the brain. It offers good protection for the brain's nervous system. Whether used alone or as a prescription, *A. tatarinowii* is an important and indispensable herb to treat depression and is used in the TCM treatment system ^[9]. However, some clinical observations have shown that the active ingredients of *A. tatarinowii* have potential toxicity. Therefore, it is necessary to be cautious in using *A. tatarinowii* as a treatment method, strictly control the dose of *A. tatarinowii*, and better protect people's health ^[10]. If it is disturbed and stimulated by the external environment, it will aggravate the poisoning condition. Therefore, safety measures and comprehensive research should be carried out in the future ^{[11][12]}. The exploitation and TCM applications in the prevention and treatment of various diseases are gradually growing due to the in-depth study of TCM. Thus, research on *A. tatarinowii* is becoming increasingly necessary ^[13].

2. Botany

A. tatarinowii is a semi-evergreen perennial hairless plant. It usually grows in creeks, ponds, and other humid environments below 2600 m. According to the online records of China's flora (<http://www.cn-flora.ac.cn/index.html> accessed on 15 March 2023), it has a creeping rhizome. The rhizome is aromatic, with a thickness of 2–5 mm, externally

light brown, and its internode length is 3–5 mm, with mostly fibrous roots. The rhizome's upper part is very dense, and branches are often fibrous, persisting at the leaf base. Leaves are sessile with a thin leaf blade, with membranous leaf sheaths up to 5 mm wide on both sides of the base, ascending to the middle of the leaf blade, tapering, and undergoing abscission. The leaf blade is dark green, linear, 20–30 cm long, and its base is folded in half and spread above the middle. It is 7–13 mm wide, with a tapering apex, no middle rib, many parallel veins, and a slightly raised angle. It has an axillary inflorescence stalk, 4–15 cm long, that is triangular. The bracts are 13–25 cm long, the fleshy spikes are 2–5 times longer, and are subequal in length. The inflorescences are terete, 4–6.5 cm long, 4–7 mm thick, superficially acuminate, erect, or slightly curved. The flowers are white. The mature fruit is 7–8 cm long and up to 1 cm thick. The young fruits are green, yellow-green, or yellow-white when mature. The flowering period is from February to June. Usually, rhizomes are dug out in autumn and winter, and leaves and fibrous roots are removed, cleaned, and further dried to obtain the medicinal part of *A. tatarinowii*. The *A. tatarinowii* herbal parts used in Chinese medicine are usually flat or long and thick. The plant's features are shown in **Figure 1**. The outer skin is gray-brown, with some visible links and root marks. The cut surface is fibrous, white, or reddish, with distinct rings and oil spots. It has a sweet odor and a bitter, pungent taste. The observation of some sections of *A. tatarinowii* under the microscope showed that the outer wall of epidermal cells on the transverse section of the *A. tatarinowii* rhizome was thickened and brown, and some also contained reddish-brown substances. The cortex of *A. tatarinowii* is wide, with scattered fiber bundles and leaf trace vascular bundles. The leaf trace vascular bundle is externally hardened, and the vascular bundle sheath fibers are ringed and lignified; the endodermis is clearly visible. The vascular bundle of the middle column is of the wood type and outer type, and the vascular bundle sheath fiber is less. The cells around the fiber bundles and vascular bundle sheath fibers contain calcium oxalate crystals, forming crystalline fibers. Round-like oil cells are scattered in parenchyma cells that contain starch granules.



Figure 1. Plant morphology of *A. tatarinowii*. (A) Whole plants, (B) leaves, (C) inflorescences, (D) rhizomes, (E) dry rhizomes, and (F) Chinese herbal pieces.

3. Traditional Uses

A. tatarinowii has been widely used as a medicinal plant in China for 2000 years. Since ancient times, researchers have continuously explored and exploited TCM practices. TCM uses in the treatment and prevention of disease have boosted trust and resolve in its advancement and innovation. In the recorded history of folk culture, *A. tatarinowii* is a commonly used TCM. Generally speaking, each TCM has its inherent taste and characteristics. *A. tatarinowii* has a bitter and spicy taste and a warm nature. In addition, according to the different meridians of each TCM, *A. tatarinowii* has a stimulating effect on the heart and stomach meridians. Based on its action on these meridians, it can calm the mind, resolve dampness, harmonize the stomach, and unblock painful obstructions. It releases the exterior while dispersing cold and expelling wind-dampness. The property of sexual taste meridian attribution is very important in guiding clinical drug applications in the TCM system [14]. It is used for multiple medicinal purposes, traditionally for treating epilepsy, depression, fever, dizziness after a high fever, deafness, heartache, stomachache, and other diseases. *A. tatarinowii* has a long medicinal use history in China, and it is not only an important TCM itself but is also a critical part of TCM prescriptions [15][16][17][18][19]. In addition to using *A. tatarinowii* to treat different diseases, *A. tatarinowii* can be combined with different TCMs to achieve improved therapeutic effects. For example, *A. tatarinowii* is commonly used with TCMs such as bupleurum and turmeric, which have significant antidepressant effects, to prepare a mixed formulation to improve its antidepressant effect. It is commonly used in depression-like disorders in the clinical environment [20][21]. Further, preclinical studies have shown that *A. tatarinowii* has strong antidepressant activity. Many studies have found that its water extract, ethanol extract, and extract with other solvents have strong activity from the perspective of different extraction methods. Further studies have shown that the active ingredient asarone exhibits a strong antidepressant effect

and is of great research value [9]. In addition to this, the *A. tatarinowii* ethanol extract has antifungal activity and can be used to treat digestive diseases, such as diarrhea [4]. In addition, in Korean medicine, after a lot of verification, it has also been found that *A. tatarinowii* has a positive therapeutic effect on brain diseases such as meningitis and is also effective for AD, Parkinson's disease (PD), and other neurological diseases caused by population aging. In addition, the process of *A. tatarinowii* treating brain diseases and nervous system diseases has been found to be the same as in our cognition of the TCM system [22][23][24]. In short, the various therapeutic effects of *A. tatarinowii* in traditional uses, as well as its potential for future applications, have been supported by abundant evidence and warrant further investigation.

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