

Review

Tremendous health benefits and clinical aspects of *Smilax china*

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A lot of species of *Smilax* known as Baqia in China are used in folk medicine for various purposes. *Smilax china* L., is a small vine that grows in the southern parts of China, known as Jin Gang Ten, which has a long history of indigenous use in China. *S. china* consists of fat, saponins, glucosides, gum, starch, flavonoids, tannins, and alkaloids. *S. china* has been used in traditional Chinese medicine because it has effective components such as triterpenoid, saponins, flavones, stilbenes, and organic acids. Roots are the most common used part; stems and rhizome can be used also in the form of powder or paste, raw or cooked. The most important health benefits of *S. china* are energy tonic, impotency and seminal disorders, chronic arthritis and secondary and tertiary syphilis, schizophrenia and epilepsy, pemphigus and skin diseases, osteo-arthritis, leucorrhea or white discharge, relieving joints numbness, diabetes and excretory system. The obtained findings strongly suggest potential of *S. china* as an additive in pharmaceutical industries.

Key words: Health benefits, *Smilax china*, pharmaceutical industries, traditional Chinese medicine.

INTRODUCTION

The use of traditional Chinese herbs and fruits for the treatment and management of diseases is common in developing countries and it is improving in developed countries (Soleymani and Shahrajabian, 2012; Ge et al., 2018; Shahrajabian et al., 2018; Shahrajabian et al., 2019a,b,c,d). In recent years, pharmacokinetic and metabolic studies of traditional Chinese medicine have attracted extensive attention and promoted in many regions (Ogbaji et al., 2018; Soleymani and Shahrajabian, 2018). The genus *Smilax* (Liliaceae family) comprises about 300 species of climbing flowering shrub (Xie et al., 2018). Some of the *Smilax* plant distributed in Asia area includes Taiwan, China, and Japan (Huang,

2000). China cultivates this drug in large amount; hence, it is usually recognized as China root. The most important popular common names of the plants are China root, Chinese smilax and Bambook Briar Root. Many species of *Smilax* are known as Baqia in China and are used in folk medicine for various purposes (Ao, 2013). Shu et al. (2006) reported that *Smilax china* L., is a small vine that grows in the southern parts of China, known as Jin Gang Ten, which has a long history of indigenous use in China. Yang et al. (2008) found that the rhizome of *S. china* has been used in traditional Chinese medicine because it has effective components such as triterpenoid saponins, flavones, stilbenes and organic acids. Local

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Table 1. Local names of *Smilax china* L. in different languages.

Latin name	Smilax china
English name	China root
Hindi name	Chopchini, Chobchini, Toupchini
Mizoram name	Kaitha
Tamil name	Ayadi
Malayalam name	Kaltamara
Marathi name	Ghotvel
Telugu name	Kondadantena
Kannada name	Kaaduhambu
Bengali name	Kumarika
Oriya name	Mootrilata

Table 2. Phytochemical tests of *Smilax china* (Saravanakumar et al., 2014).

Group test	Name of the test	Observation
Carbohydrate and gums	Molish test	+
Reducing sugar	Fehling's Solution test	-
	Benedict's test	-
Alkaloids	Mayer's test	-
	Dragendorff's test	-
	Wagner's test	-
	Hagner's test	+
Steroides	Salkowski reaction	+
	Libermann-burchared reaction	+
Glycosides	Salkowski reaction	+
	Libermann-burchared reaction	-
Tannins	Ferric chloride test	-
	Potassium dichromate test	+
	Keller-Kiliani test	+
Flavonoids	Hydrochloric acid test	-
Saponins	Foam test	-

names of *S. china* L. in different languages are shown in Table 1.

CHEMICAL CONSTITUTIONS

S. china consists of fat, saponins, glucosides, gum, starch, flavonoids, tannins and alkaloids (Saravanakumar et al., 2014). Feng et al. (2003) showed that 5 phenyl compounds were isolated from the roots of *S. china* and they are dihydrokaempferol (1), 3,5,4'-trihydroxystilbene

(2), 3,5,2',4'-tetrahydroxystilbene (3), dihydrokaempferol 3-O- α -L-rhamnoside (engeletin, 4), and quercetin 4'-O- β -D-glucoside (5). Shao et al. (2009) found that seven flavonoids and four stilbenes were isolated and identified as dihydrokaempferol-5-O- β -D-glucoside (I), engeletin (II), isoengeletin (III), dihydroquercetin-3-O-glycoside (IV), 3, 5, 7, 3', 5'-pentahydroxy-flavanonol (V), astilbin (VI), quercetin-3'-O-glycoside (VII), piceid (VIII), scirpusin A (IX), resveratrol (X), and oxyresveratrol (XI). Results of phytochemical tests of *S. china* are shown in Table 2. Names of flavones and isoflavones isolated from *S. china*

Table 3. The names of flavones and isoflavones which isolated from *S. china* L. (Zhao et al., 2016).

Flavones	Kaempferol
	Kaemperide
	Morin
	Kaempferol 7-O- α -L-ranmnoside
	Kaemperin
	Quercetin-4'-O- β -D-glucoside
	Vitexin
	Kaempferitrin
	Lepidoside
Rutin	
Isoflavones	Pratensein
	Puerarin
	Smilachinin

L. are shown in Table 3. Shao et al. (2007) reported that the six major active constituents in *S. china* are (1) Taxifolin-3-O-glycoside; (2) piceid; (3) oxyresveratrol; (4) engeletin; (5) resveratrol; (6) scirpusin A. Structural compounds 1 to 6 identified from *S. china* are as shown in Figure 1.

HEALTH BENEFITS

S. china L. known as Jin Gang Ten, has been widely used as a traditional herbal medicine for the treatment of gout, rheumatoid arthritis and other diseases for a long time in China (Chen et al., 2011). Shu et al. (2004) confirmed that the tuber of *S. china* L. has anti-inflammatory, anticancer, and anticoagulation activities. In Chinese medicine, it has been extensively used for clinical treatment of syphilis, acute bacillary dysentery acute, chronic nephritis and antitumor (Chen et al., 2002). The rhizomes of *S. china* is commonly used as herbal materials in traditional Chinese medicine (Liang et al., 2016). Park et al. (2014) concluded that *S. china* methanol extract (SCME) has active compounds which have anti-obesity activities. Vijayalakshmi et al. (2013) reported that the ethyl acetate fraction of *S. china* rhizome showed maximum antipsoriatic activity. Chen et al. (2011) concluded that *S. china* L. exhibits anti-hyperuricemic and nephroprotective activity in hyperuricemic animals. Jeong et al. (2013) reported that *S. china* has antimicrobial, antimutagenic, antioxidant, anti-inflammatory, anti-cancer and neuroprotective effects. Shim (2012) also recognized *S. china* has a good source of natural antioxidant. Raju et al. (2012) also showed that *S. china* is an anti-diabetic plant which is responsible for the hypoglycemic activities. Bhati et al. (2011) reported that the hydroalcoholic and aqueous fractions exhibited anti-diabetic activity in rats with alloxan-induced diabetes. Seo et al. (2012) indicated that *S. china* L. possesses antioxidant and antimicrobial substances,

and suggested that the ethanol extract can be applied into food and cosmetic industry. Wu et al. (2010) showed that polyphenols are the active components of *S. china* L. responsible for the anti-breast tumor cell activities. Saraswathi and Nithya (2010) suggested that the hypoglycemic and hypolipidemic property of *S. china* could be useful for the treatment of diabetes. Sarvana and Felicia (2015) also claimed that *S. china* extracts have antioxidant activity which can be used to treat various diseases. Shu et al. (2006) stated that ethyl acetate extract of *S. china* possesses remarkable anti-inflammatory effects on acute inflammation, and also displays anti-inflammatory effects on the chronic inflammation at a certain extent. Pan et al. (2014) concluded that water extraction from *S. china* (WESC) suppressed fat accumulation and decreased the weight gain in mice, which was mainly due to increase of the activity of fat oxidation enzyme in liver, promotion of the fatty acid β -oxidation. Lee et al. (2016) suggested that the extract from *S. china* L. has great potential as a cosmetic ingredient with whitening effects. Vijayalakshmi et al. (2012) have found the flavonoid quercetin in *S. china* and they have stated that it is promising for further investigations to prove its anti-psoriatic activity. Cong et al. (2016) noted that those patients who received Azithromycin therapy added with *S. china* capsules concurrently could significantly improve levels of lymphocyte subsets, cytokines and hemorheology index. Yang et al. (2019) stated that *S. china* L. ethanol extract (SCLE) could lead to a decrease in body weight gain and fat mass by inhibiting the lipid synthesis and promoting lipolysis and β -oxidation in high-fat diet (HFD) fed mice. Pharmacological studies have also suggested that *S. china* has a neuroprotective effect (Ban et al., 2006). Lee et al. (2018) demonstrated the potent therapeutic efficacy of *S. china* L., and its potential use as a cost-effective natural alternative medicine against type 2 diabetes and its complications. Nho et al. (2015) reported that *S. china*

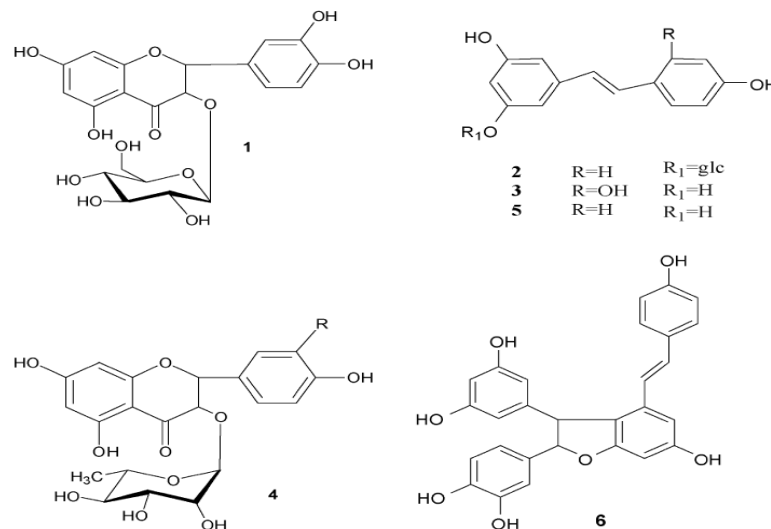


Figure 1. Structural compounds 1-6 identified from *S. china*. (1) Taxifolin-3-O-glycoside; (2) piceid; (3) oxyresveratrol; (4) engeletin; (5) resveratrol; (6) scirpusin A (Shao et al., 2007).

Table 4. The most important traditional uses and benefits of China root.

Root is alternative, anti-scrophulatic, carminative, depurative, diaphoretic, diuretic and tonic.

It is useful when taken internally in the treatment of old syphilitic cases and it also used for certain skin diseases, including psoriasis, rheumatoid, arthritis, gout, enteritis, urinary tract infections, skin ulcers, etc.

Large doses can cause nausea and vomiting, which is appreciated in weakened and depraved conditions due to a poisoned state of the blood.

Smilax is helpful in improving muscle mass and body strength.

It is used as a tonic for male sexual energy.

Smilax has a special property as it acts against the problems caused due to malnourishment of Dhatus such as poor immunity and weakness.

Decoction of roots and rhizomes used as depurative in cases of herpetism and syphilis.

It is Sudorific and demulcent, used in rheumatism.

It is used for various skin diseases.

It is used as a depurative, diaphoretic, stimulant, alterative, antisymphilitic and asphrodisiac

It is used as alterative in old syphilitic cases and in chronic rheumatism.

In TCM, used as diuretic and for treatment of rheumatic arthritic conditions; also used for detoxification, treatment of gout, tumors and lumbago.

It is used for syphilis, skin disease, epilepsy, insanity, flatulence, dyspepsia, constipation, fever, neuralgia, rheumatism, gout and general debility in Ayurveda, Siddha and Unani medical system.

It is used as a remedy for inflammatory disease and ischuria.

Rhizome is made into a paste and applied to painful swellings.

It has also been supported in the treatment of leprosy, scrofula and many skin infections developing into ulcers.

Roots have been used to treat abscesses, pyoderma and burns.

It was one of the drugs used in the treatment of acute appendicitis, taeniasis and constipation.

Roots have been used to treat cases of paralysis and sciatica.

It is used to treat urinary tract infection, stone and ulcers of the bladder and even chyluria by the physicians.

It is also used to treat fever and other inflammatory conditions associated with fever like acute lymphadenitis.

It helps in relieving strangury and also seminal weakness.

L. extract (SCLE) exerts an anti-metastatic effect on human breast cancer cells. The most important traditional

uses and benefits of *S. china* are shown in Table 4. The most important health benefits of China root are shown in

Table 5. The most important health benefits of China root.

Energy tonic
Impotency and seminal disorders.
Chronic arthritis and secondary and tertiary syphilis.
Schizophrenia and epilepsy.
Pemphigus and skin diseases.
Osteo-arthritis
Leucorrhoea or white discharge.
Relieving joint numbness
Diabetes
Excretory system.

Table 5.

CONCLUSION

S. china L. known as China root has been used for thousand years in numerous tribal and folk medicine. The plant is native to China, Korea, Taiwan, Japan, Philippines, Vietnam, Thailand, Myanmar and Assam. *S. china* consists of fat, saponins, glucosides, gum, starch, flavonoids, tannins and alkaloids. The rhizomes are bitter, acrid, thermogenic, anodyne, anti-inflammatory, digestive, laxative, depurative, diuretic, febrifuge and tonic. It is used in dyspepsia, flatulence, colic, constipation, helminthiasis, skin diseases, leprosy and psoriasis, syphilis, strangury, seminal weakness, general debility, detoxifies organs, cleanses blood, aids absorption and kills bacteria; it is also used for fever, epilepsy, insanity, neuralgia and stimulates digestion, increases urination, protects liver and promotes perspiration. In Chinese medicinal science, it has been used for clinical treatment of syphilis, acute bacillary dysentery acute, chronic nephritis and antitumor. On the basis of scientific literatures, *S. china* L. demonstrates important and promising health benefits. In general, treatment with natural and traditional medicine, especially *S. china* L is recommended.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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