

## Perspective

# Pharmacological Evaluation, Phytochemical Analysis and Medicinal Properties of *Smilax chinensis* D.C.

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## Abstract

*Smilax chinensis* DC is commonly used in traditional system of medicine for numerous therapeutic purposes. The present article was written to search the various actions of different parts of *Smilax chinensis*. Likewise, various plants have been investigated for their potential to treat various ailments and the knowledge about the use of the plant has been transferring from generation to generation. Hence, developing countries depend on the medicinal plants for the treatment of various ailments. Moreover, the paper was aimed to present the scientific proof for the therapeutic uses, potential ingredients, and the pharmacological activities of *Smilax chinensis*. *Smilax chinensis* has been prescribed in inflammatory disorders and to manage rheumatism as well as other diseases. Moreover, earlier studies showed that *Smilax chinensis* possesses hepatoprotective, anti-cancer, antioxidant, anthelmintic and antimicrobial activity. Hence, medicinal uses, active principles, pharmacological activity, and medical uses have been described herewith.

### Keywords:

*Smilax chinensis*, bioactive constituents, phytochemicals, pharmacological activities, medicinal properties

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## BACKGROUND

Tibbi name of this plant is Chobchini. It is also called china root and its botanical name is *Smilax chinensis*, Family; Liliaceae, Part used; Root. It is a deciduous climber, native to China and Japan. Stems are unarmed and sparsely prickled; leaves are rounded, or wedge-shaped. This plant contains Beta-sitosterol, Caffeic acid, catechin, daucosterin, daucosterol, engeletin, epicatechin, friedelin, heloniosides, hydroxyflavan, isoengeletin, naringenin, piceid, quercetin, resin, resveratrol, rutin, saponin, scirpusin, seiboldogenin, smilacin, smilasides, tannin, taxifolin, trihydroxystibene, vanillic acid, flavonoids and stilbenes<sup>1</sup>. A study was conducted for the determination of kaempferol and quercetin in *Smilax chinensis* obtained from different places (Zhang Jia Jie, Hunan, and Chibi Hubei). Kaempferol, quercetin, and impurities were separated. The concentration of kaempferol and quercetin were highest in Zhang jia jie, Hunan and lowest in Chibi, Hubei. It was found that there is a difference between the content of kaempferol and quercetin in *Smilax chinensis* obtained from different places<sup>2</sup>. Tuber root of *Smilax chinensis* has medicinal activity. It is used to treat syphilis, gonorrhoea, swelling, abscess, and boils. It is widespread in tropical forests in India<sup>3</sup>. This plant is known to be rich in steroidal saponins<sup>4</sup>. *Smilax chinensis* is prescribed in the management of gouty arthritis<sup>5,6</sup>. It has various pharmacological activities. *Smilax chinensis* is also prescribed in sexual disorders, especially for chronic pelvic inflammation<sup>7</sup>. China root was considered useful in Europe for venereal and rheumatic disorders. It is used to treat sexually transmitted diseases, rheumatoid arthritis and gout (*Naqras*)<sup>8</sup>. This plant is found in Afghanistan, Andhra Pradesh, India, Karnataka, Pakistan, Tamil Nadu, and the United Kingdom. *Smilax chinensis* is often used as a blood purifier especially when atrabillious malhumours is in excess and disorders such as chronic obstructions and irritation to the kidneys or bladder. It has a specific use in diseases of spasmodic origin. In combination with other useful herbs, it is administered orally to relieve chronic nervous disorders. *Smilax chinensis* has been used for centuries to treat various diseases. Several chemical constituents of *Smilax chinensis* have been isolated<sup>9</sup>. It is prescribed in psoriasis, rheumatoid arthritis and gout<sup>10</sup>. *Smilax chinensis* is a stimulant of the pituitary gland and is considered as a substitute for adrenal steroids<sup>11</sup>. Hence, the present study was conducted to evaluate the reported pharmacological activities and medicinal properties of *Smilax chinensis* and to explore its future perspective in term of miraculous therapeutic effects. Moreover, further clinical studies are required on a large-scale to justify possible phytopharmaceutical effects of *Smilax chinensis*.

**Pharmacological activities:** Demulcent, resolve and expel vicious malhumours, tonic for vital organs, diaphoretic, alterative, anti-flatulent, blood purifier, deobstruent, diuretic and emmenagogue, aphrodisiac, desiccative, anodyne, sedative, anti-syphilitic. *S. chinensis* exhibits various pharmacological activities (Table 1).

Table 1: Pharmacological activities of *S. chinensis*

Activity	Dosage form	Dose	Model
Anti-obesity	Methanolic extract	100 to 200 mg/kg	Rats <sup>[20]</sup>
Anti-inflammatory and analgesic	Ethyl acetate and methanolic extract	250 to 400 mg/kg	Rodent <sup>[21]</sup>
Antidiabetic	Methanolic extract	200 & 400 mg/kg	Rats <sup>[22]</sup>
Anticonvulsant	Ethanol extract and ethyl acetate fraction	200 and 400 mg/kg	Mice <sup>[17]</sup>
Anti-inflammatory	Ethyl acetate fraction	10 and 50mg/kg	Rats <sup>[23]</sup>
Antioxidant	Ethanol extract	100 and 200 mg/kg	Rats <sup>[24]</sup>
Hepatoprotective	Chloroform, ethyl acetate and methanol extracts	100 mg/kg	Rats <sup>[23]</sup>
Anti-arthritis	Decoction	90, 180 g/kg (intragastric injection (ig)	Mice <sup>[14]</sup>

**Anti-inflammatory activity:** *Smilax chinensis* has anti-inflammatory activity that is evident from a study on rats<sup>12</sup>. Gouticin, herbal coded formulation containing different medicinal plants components including *Smilax chinensis*, has an anti-inflammatory effect and has been proven effective in gouty arthritis<sup>6</sup>. Anti-inflammatory properties of this plant is evident from various *in vitro* and *in vivo* studies.

**Anti-nociceptive and anti-inflammatory:** *Smilax chinensis* was investigated for anti-inflammatory effects in rats with egg albumin-induced edema and anti-nociceptive activities in mice using hot-plate test and acetic acid-induced abdominal

constriction test, respectively. The water extract (1000 mg/kg) had a significant anti-inflammatory and anti-nociceptive activity as compared to saline. The anti-inflammatory activity of *Smilax chinensis* is comparable to acetylsalicylic acid (200 mg/kg). The water extract was evaluated for inhibition of prostaglandin formation in lipopolysaccharide (LPS)-induced mouse macrophage cells. The data shows that both inhibitors of COX activity and COX expression are inhibited by the extract<sup>13</sup>. Due to these pharmacological effects, this plant extract can be used to treat a number of inflammatory conditions.

**Effect of *Smilax chinensis* on adjunctive arthritis mouse:** The study was done to evaluate the effect of *Smilax chinensis* on adjunctive arthritis (AA) of the mouse. Decoction inhibited adjunctive mouse arthritis, reduced thymus and spleen weights, and decreased CD4/CD8. The study shows that decoction has therapeutic effects on the regulation of cellular immunity<sup>14</sup>. Hence, immunomodulatory effects of this plant have been proven as the plant extract was reported to regulate cellular immunity.

**Anticonvulsant activity of *Smilax chinensis*:** A study was conducted to investigate the anticonvulsant effect of *Smilax chinensis* in mice. As a conclusion, it was found that *Smilax chinensis* has anti-convulsive efficacy and can be prescribed for the treatment of epilepsy<sup>15</sup>. The direct experimental evidences was reported for this plant as it contains biochemical constituents that are more effective for convulsion as compared to allopathic drugs.

**Antihyperuricemic activity:** A study was conducted to evaluate the efficacy of *Smilax chinensis* on hyperuricemia and renal dysfunction in oxonate-induced hyperuricemic animals. *Smilax chinensis* extracts were orally administered to hyperuricemic mice. Findings show that *Smilax chinensis* extracts have anti-hyperuricemic and nephron-protective activity<sup>16</sup>. In another study, Astilbin from *Smilax chinensis* has been investigated for its efficacy on hyperuricemia and nephropathy in rats. Astilbin was administered in the fructose-induced hyperuricemic rat. This study indicated that astilbin has hypouricemic activity because of the uricosuric effect. Astilbin is also nephroprotective and recovers urea and creatinine in astilbin-treated rats. Astilbin inhibits monosodium-urate production and the formation of interleukin-1 (IL-1) and prostaglandin E (2) (PGE) (2). Study shows that astilbin is safe and effective in hyperuricemia and renal disease<sup>17</sup>. Hence, on a large scale, the various studies on this plant had proven its pharmacological activity in hyperuricemic patients.

**Antipyretic Activity:** Antipyretic activity of *Smilax chinensis* has been investigated. Pyrexia was induced by subcutaneous injection of yeast suspended in methylcellulose solution. Oral administration of *Smilax chinensis* reduced significantly elevated body temperature of the rat. This antipyretic activity was more than that of aspirin (a standard antipyretic product)<sup>18</sup>. Hence, *Smilax chinensis* was reported to have extensive antipyretic activity than that of other anti-pyretic drugs.

**Antimicrobial and antioxidant activity:** Antimicrobial and antioxidant potential of *Smilax chinensis* extracts acquired with water, acetone, ethanol, and methanol were evaluated. Antioxidant potential was investigated by determining the reducing power, total phenol contents, ABTS radical scavenging effect, and DPPH radical scavenging activity. The ethanol extracts exhibited the highest reducing power, ABTS radical scavenging potential, and the DPPH activity. Paper disc method was used for determination of antibacterial potential against foodborne microorganisms. The growth of *Salmonella Typhimurium*, *Staphylococcus aureus* and *Listeria monocytogenes* was inhibited by all the extracts of *Smilax chinensis*, though no antibacterial potential was shown against *Escherichia coli* O157: H7. It is concluded that *Smilax chinensis* has antimicrobial and antioxidant ingredients, and recommend that ethanol extract can be used in the cosmetic and food industry<sup>19</sup>. Hence, *Smilax chinensis* was reported to have extensive antimicrobial activity as it inhibits growth of microbes.

**Toxicity study:** In acute toxicity study, ethanolic extract (EESC) and ethyl acetate fraction (EAF) of *S. chinensis* did not cause any mortality at a dose of 2 g/kg in mice. There were no gross changes in behavior at higher doses<sup>14</sup>. Hence, the plant extract was reported to have least or no toxic effects even at high doses.

## CONCLUSION

The pharmacological effects of *Smilax chinensis* as antinociceptive, anti-inflammatory, antihyperuricemic, antipyretic, anticonvulsant, etc. have been documented. In conclusion, *Smilax chinensis* has an extensive variety of medicinal uses and can be prescribed either as single medicine or as compound medicine to manage numerous diseases. It can be prescribed as a preventive drug because of its efficacy against inflammatory disorders. Although various scientific studies reveal the medicinal uses of *Smilax chinensis* *in vitro* and in animal models, other clinical studies are required for investigating its efficacy on various patients.

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