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Review Article

Current Scientific Perspectives on the Ethnomedicinal Relevance and Pharmacological Potential of *Smilax china* L.

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ABSTRACT

Smilax china L. is a widely utilized medicinal plant in traditional systems such as Unani, Ayurveda, and Traditional Chinese Medicine (TCM), valued for its diverse therapeutic benefits. This review summarizes current ethnomedicinal knowledge, phytochemical composition, and pharmacological evidence to provide a comprehensive scientific understanding of the species. Many research studies have reported that *S. china* is rich in diverse secondary metabolites, including flavonoids, phenolic compounds, saponins, tannins, stilbenoids, and polysaccharides, which play a key role in its therapeutic potential. Extensive in vitro and in vivo studies demonstrated its anti-inflammatory, antioxidant, anticancer, hepatoprotective, antidiabetic, anti-obesity, antimicrobial, antiviral, analgesic, anti-arthritis, anti-gout, immunomodulatory, neuroprotective, and cardioprotective activities. Mechanistic investigations reveal modulation of key molecular pathways such as NF- κ B, MAPK, PI3K/AKT, AMPK, IRS/AKT, Nrf2-ARE, and uPA/uPAR, supporting its multi-targeted pharmacological actions. Despite strong preclinical evidence and traditional relevance, scientific gaps persist regarding clinical validation, dose standardization, safety profiling, and phytochemical consistency. Overall, *Smilax china* represents a promising natural therapeutic resource with significant potential for drug development and integrative medicine. Further systematic studies, including toxicological and clinical evaluations, are essential to fully establish its efficacy and translational applicability.

INTRODUCTION

The Unani system of medicine, rooted in the theory of the four humors, has long utilized natural resources, such as plants, for therapeutic purposes. Among these, *Smilax china* Linn., commonly

known as Chobchini or China root, holds an important place due to its wide ethnomedicinal applications. Traditionally, its root and rhizome have been used in India, China, Japan, Iran, and other Asian countries in both folk and formal

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systems of medicine, including Unani, Ayurveda, and Traditional Chinese Medicine (TCM).

In Unani medicine, Chobchini is considered a potent agent for managing chronic conditions, particularly those linked to melancholic and phlegmatic disorders. Historically, it was discovered during times of scarcity when edible roots were foraged, and its agreeable taste and healing effects on chronic ailments such as ulcers and arthritis contributed to its widespread medicinal use.^[1]

The plant has different local names in India:^[2]

- 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

Smilax china Linn. (family Liliaceae) is known by different names in various regions. In China, it is called “Ba Qia” or “Jin Gang Teng,” while in Pakistan it is known as “Bilri.” The genus *Smilax* includes about 350 species, widely distributed in tropical and temperate regions, especially in North America and East Asia. In traditional Chinese medicine (TCM), *Smilax china* has been used for many years to treat different diseases, such as

chronic kidney inflammation, syphilis, dysentery, and pelvic infections. Its importance comes from the special natural compounds it contains, called phytochemicals. These include tannins, flavonoids, phenolic compounds, glycosides, steroids, and saponins. Phytochemicals are bioactive substances that help the plant defend itself, but they also have strong effects on the human body. Because of this, they can be used to develop useful medicines. Each plant species may contain different active compounds, which makes them valuable for treating a variety of health problems. Additionally, the plant is thought to be extremely stimulating and resolvent for gas, dyspepsia, and constipation. Beneficial for rashes and neuralgia. It is primarily used to treat rheumatoid arthritis and gout. The nervous system is also beneficial in cases of fever, and it fortifies the entire body.^[3]

Scientific Classification^[3]

- Kingdom : Plantae
- Clade : Tracheophytes
- Clade : Angiosperms
- Order : Lilliales
- Family : Smilacaceae
- Genus : *Smilax*
- Species : *S. China*

CHEMICAL CONSTITUENTS

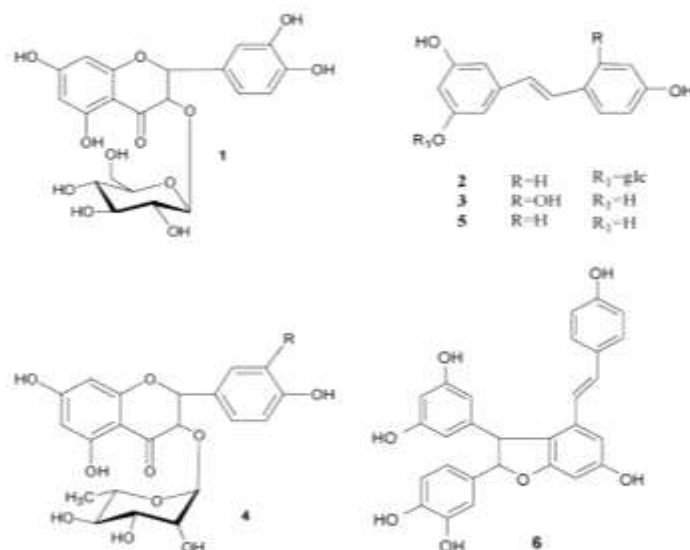
Smilax china contains a wide variety of bioactive compounds, mainly saponins, flavonoids, phenolics, glycosides, tannins, and steroids, which are responsible for its pharmacological effects. The key constituents include:

Table No.1 Chemical Constituents of *Smilax china* Linn. [4]

Constituent	Examples	Pharmacological Activity
Saponins	Dioscin, Furostanol saponins	Anti-inflammatory, anticoagulant, cytotoxic, anti-thrombotic
Phenolic compounds	Resveratrol, Oxyresveratrol, Piceid, Scirpusin A	Antioxidant, anticancer, apoptosis-inducing



Flavonoids	Quercetin, Kaempferol-7-O- β -D-glucoside, Engeletin, Taxifolin-3-O-glycoside	Antioxidant, anticancer, anti-inflammatory, antimutagenic
Glycosides	Salicin	Anti-inflammatory, analgesic, antipyretic, wound healing
Tannins	Tannic acid	Antimicrobial, antiviral, antifungal, anticancer
Other compounds	Smilasides, Smiglasides	Antioxidant, anti-inflammatory, anticancer



Structural compounds 1-6 identified from *S. china*.^[5] (1) Taxifolin-3-O glycoside; (2) piceid; (3) oxyresveratrol; (4) engeletin; (5) resveratrol; (6) scirpusin A



Fig.1 *Smilax china* L.

BOTANICAL DESCRIPTION^[1]

S. china is a climbing plant with a thorny, long, thin stem. Its branches feature tendrils that adhere to other plants or objects, helping it to grow

steadily upwards. Using its hooked thorns to cling to and crawl over branches, the plant may climb trees and other plants up to ten meters in height. It flowers in May and June, producing clustered white or green blossoms. Following pollination, it bears round berries that range in color from brilliant red to blue-black, with a diameter of roughly (5–10) mm. The heart-shaped leaves range in length from 4 to 30 cm depending on the species. The root fragments are around 12–15 cm long and 0.5–1 cm thick. They have a cylindrical form with a tapering tip. The outside surface is reddish-brown and rough, while the inner surface is yellowish, with a coarse and fibrous feel when split.



Fig.2 Cylindrical root



Fig.3 berries



Fig.4 Leaves



Fig.5 hooked thorns on stem

DESCRIPTION AND ETHNOBOTANICAL USES OF S. CHINA

Vernaculars and ethnomedicinal usage

China root is a frequent name for *S. china*. In Arabic, it is referred to as *Asl-us-Seenee* and *Khashab-us-Seenee*; in Urdu, *Chobchini*; in Hindi, *Chobchini*; in Sanskrit, *Chopchine*; and in Persian, *Beekh-e-Cheeni*^[6]

The plant, known in China as "*Jingangteng*" or "*Baqia*," is used extensively in Traditional Chinese Medicine (TCM) to treat inflammatory disorders such as gout, rheumatoid arthritis, lumbago, and detoxification.^[7] In Japan, *S. china* has been recognized in traditional medicine for its anti-inflammatory and anti-rheumatic effects. According to Unani ideas of humoral balance, the root is acknowledged in Iranian Persian traditional medicine for its use in treating skin disorders, venereal infections, and blood purification.^[8]

Geographical source and habitat

There are about 350 species in the genus *Smilax* (*Smilacaceae*), which are found worldwide in temperate, tropical, and subtropical climates. Asia, Europe, Oceania, and the Americas are home to these plants. There are many different species in the *Smilax* genus, most of which are climbing shrubs and some of which are upright herbs. *Smilax* plants often grow as shrubs, generating dense, impenetrable thickets. *Sarsaparilla* is a common term for several species of *Smilax*.^[9]

PHARMACOLOGICAL POTENTIALS OF "SMILAX CHINA"

Anti-inflammatory activity:

By suppressing the COX-2 activity and TNF α generation caused by lipopolysaccharide (LPS) in murine peritoneal macrophages, *Smilax china*

anti-inflammatory properties were examined. The nine compounds suppress the generation of PGE₂ generated by LPS in mice peritoneal macrophages at a closing dose of 105 Moles at the following rates: 76.1%, 78.5%, 75.9%, 82.0%, 59.1%, 82.5%, 81.5%, 76.5%, and 81.7%, respectively. The positive control in this study was indomethacin. According to the results of this initial screening, each compound significantly inhibited COX-2. ^[10] The test for carrageenan-induced hind paw swelling was conducted. Carrageenan-induced paw swelling was notably diminished by SA (Sieboldogenin) treatment in a dose-dependent manner. ^[11]

Antioxidant activity:

Smilax china L. has been reported to exhibit significant antioxidant potential, primarily attributed to its rich phenolic content. Among various solvent fractions, the ethyl acetate fraction demonstrated the strongest antioxidant activity, which correlated with the presence of high concentrations of epicatechin and catechin. In a detailed investigation of the root extract, the methanolic extract (Me) displayed notable DPPH free radical scavenging activity with an IC₅₀ value of 7.4 µg/mL, along with pronounced cytoprotective effects. Further solvent partitioning into ethyl acetate and aqueous fractions also revealed substantial DPPH radical scavenging capacity, confirming the presence of potent antioxidant constituents across multiple fractions. Moreover, treatment of V79-4 cells with the methanolic extract produced a dose-dependent elevation in the activities of key endogenous antioxidant enzymes—glutathione peroxidase, catalase, and superoxide dismutase—in the concentration range of 4–100 µg/mL. These findings collectively indicate that the bioactive phytochemicals of *Smilax china* roots contribute significantly to its antioxidant and cytoprotective

properties, supporting its potential therapeutic value as a natural antioxidant source ^[12, 13]

Anticancer and Anti-metastatic Activity

Recent studies have demonstrated significant anti-cancer potential of *Smilax china* Linn, particularly against highly aggressive breast cancer models. The methanolic extract of *Smilax china* rhizome exhibits potent inhibitory effects on the proliferation, migration and invasion of MDA-MB-231 triple-negative breast cancer cells. According to the study, treatment with the extract markedly decreases cancer cell viability in a dose-dependent manner and disrupts key mechanisms required for metastasis. The extract suppresses the expression of urokinase plasminogen activator (uPA) and its receptor (uPAR), while simultaneously enhancing the levels of tissue inhibitors of metalloproteinases (TIMP-1 and TIMP-2), ultimately reducing extracellular matrix degradation and metastatic potential. Additionally, morphological changes observed under microscopy confirm apoptotic features such as cell shrinkage and membrane blebbing.

Furthermore, the extract significantly reduces wound-healing migration ability, indicating strong inhibition of cancer cell motility. A clear reduction in colony-forming ability also suggests that the plant prevents long-term cancer cell survival and tumorigenic capacity. The overall findings indicate that *Smilax china* interferes with multiple stages of metastasis, including adhesion, invasion, and extracellular matrix breakdown. These results support the role of *Smilax china* as a promising natural therapeutic agent for managing highly invasive and treatment-resistant breast cancers ^[14]

Anticonvulsant activity

A study was carried out on mice to look at the anticonvulsant properties of *Smilax chinensis*. In

summary, the research indicates that *Smilax chinensis* possesses anti-convulsive activity and may be recommended for the management of epilepsy. Since this plant includes biological elements that are more effective at causing convulsions than allopathic medications, direct experimental data supporting this claim has been published.^[15]

Anti-fibrotic activity

Recent scientific investigations highlight *Smilax china* Linn (SCL) as a promising medicinal plant with significant anti-inflammatory, antioxidant and anti-fibrotic potential. According to Shi et al. (2024), SCL contains multiple bioactive flavonoids, among which astilbin (AST) is identified as the major active constituent responsible for several therapeutic effects. A network-pharmacology approach revealed that SCL acts through multi target and multipathway mechanisms, mainly involving inflammation, apoptosis regulation and inhibition of fibrotic signaling. The study demonstrated that SCL significantly interacts with key molecular targets such as AKT1, MTOR, VEGFA, CASP3, BCL2 and NF- κ B (RELA), many of which are strongly associated with pathological inflammatory and fibrotic processes. Experimental validation further confirmed that AST effectively reduces TGF- β -induced expression of fibronectin (FN) and suppresses the PI3K/AKT/NF- κ B signalling pathway, ultimately attenuating endometrial fibrosis. These findings suggest that *Smilax china* possesses potent bioactive compounds capable of modulating crucial pathways involved in inflammation and tissue fibrosis, supporting its traditional use and highlighting its therapeutic promise for conditions driven by chronic inflammation and fibrotic damage.^[16]

Anti-diabetic activity

Recent investigations have clearly demonstrated that *Smilax china* Linn exerts potent anti-diabetic, anti-obesity, and metabolic-regulating activities, primarily due to its high concentration of bioactive polyphenols. In high-fat-diet (HFD) mouse models, *Smilax china* polyphenols (SCP) significantly lowered fasting blood glucose levels, improved oral glucose tolerance, and restored normal insulin responsiveness, indicating a marked improvement in systemic glucose homeostasis. The treatment enhanced phosphorylation of key insulin-signalling proteins such as IRS-1 and AKT, and strongly activated AMPK, a central regulator of cellular energy balance. By activating this pathway, SCP promoted glucose uptake, increased fatty acid oxidation, and reduced hepatic gluconeogenesis. Additionally, *Smilax china* demonstrated a strong anti-obesity effect, evidenced by decreased body-weight gain, reduced adipocyte hypertrophy, and lower hepatic lipid accumulation.

The study further revealed that the anti-diabetic effect is closely associated with robust anti-inflammatory actions. *Smilax china* polyphenols (SCP) treatment suppressed pro-inflammatory cytokines including TNF- α , IL-1 β , and IL-6, while inhibiting activation of the NF- κ B pathway, thereby breaking the cycle of chronic inflammation linked to insulin resistance. It also improved oxidative stress markers and restored endogenous antioxidant defences, contributing to better mitochondrial function. Together, these findings confirm that *Smilax china* improves insulin sensitivity and glucose metabolism through multi-target mechanisms, involving modulation of inflammation, lipid metabolism, oxidative stress, and insulin-signalling pathways. This positions *Smilax china* as a promising natural therapeutic candidate for managing Type-2 diabetes and metabolic syndrome.^[17]



Hepatoprotective activity

Recent evidence demonstrates that *Smilax china* Linn possesses strong Hepatoprotective activity, primarily mediated through its polysaccharide fraction (SCP). In an acetaminophen (APAP)-induced liver injury model, SCP significantly reduced serum liver enzymes such as ALT, AST, and LDH, indicating marked protection of hepatocytes. Histopathological findings further confirmed that SCP treatment alleviated hepatic necrosis, inflammatory infiltration, and structural distortion caused by APAP toxicity. Mechanistic evaluation revealed that SCP activated the Nrf2–ARE antioxidant pathway, leading to up regulation of downstream antioxidant enzymes including HO-1, NQO1, and GCLC, which enhanced the liver's defense against oxidative stress. Additionally, SCP suppressed excessive oxidative damage by lowering levels of MDA and increasing SOD and GSH activities. These results highlight that *Smilax china* protects liver tissues through a combination of antioxidant, anti-inflammatory, and cytoprotective mechanisms, supporting its potential as a natural therapeutic agent for drug-induced hepatotoxicity.^[18]

Anti-gout activity

Smilax china L. has gained considerable attention as a multi-target botanical agent for the management of gout and hyperuricemia. Recent phytochemical investigations reveal that its ethyl acetate fraction is particularly rich in bioactive polyphenols such as resveratrol, oxyresveratrol, caffeic acid, rutin, quercetin derivatives, and phenolic glycosides, many of which are established natural xanthine oxidase (XO) inhibitors. In vitro studies have consistently demonstrated that these fractions exhibit strong XO inhibition, thereby reducing the conversion of hypoxanthine to uric acid. Beyond XO inhibition, *S. china* exerts significant effects on uric-acid

handling in vivo. Hyperuricemic mouse and chicken models showed that treatment with *S. china* extracts significantly lowered serum uric acid levels, restored kidney structure, and enhanced renal excretion of urate by up regulating transporters such as BCRP, URAT1, OAT1, and GLUT9, suggesting a combined uricosuric and nephroprotective effect. Additionally, the plant attenuates gout-associated inflammation by down regulating MAPK, NF-κB, and NLRP3 inflammasome pathways, leading to reduced production of inflammatory mediators including TNF-α, IL-1β, and IL-6. Some studies also highlight that fermentation of *S. china* leaves further increases XO inhibitory activity and improves bioavailability of polyphenols. Collectively, the available evidence supports that *Smilax china* L. possesses potent anti-hyperuricemic, anti-inflammatory, renal-protective, and uricosuric properties, making it a highly promising natural therapeutic candidate for gout management.^[19]

Anti-arthritic activity

The anti-inflammatory potential of *Smilax china* L. extract (ES) is compellingly demonstrated by its ability to target critical signaling pathways centrally involved in joint inflammatory conditions such as rheumatoid arthritis (RA) and osteoarthritis (OA). The study explicitly showed that ES effectively and dose-dependently suppresses the production of key pro-inflammatory cytokines, including IL-1β, IL-6, and TNF-α in LPS-stimulated cells. These three cytokines are recognized as pivotal mediators in the progression of RA and the subsequent erosion of cartilage and bone. Mechanistically, ES achieves this therapeutic effect through the negative regulation of the MAPK (p38, JNK, ERK1/2) and the NF-κB signaling pathways. Since the NF-κB and MAPK cascades are essential



regulators of inflammation and joint destruction in arthritis pathology, the selective inhibition of these upstream signals by ES suggests a profound anti-arthritic potential that warrants further *in vivo* investigation in chronic inflammatory models.^[20]

Antimicrobial Activity

Smilax china L. has been widely recognized for its broad-spectrum antimicrobial potential, attributed to its diverse phytochemical profile rich in flavonoids, phenolic acids, tannins, saponins, and stilbenoids such as resveratrol and oxyresveratrol. Several studies demonstrate that extracts prepared from the leaves, roots, and rhizomes exhibit potent antibacterial activity against both Gram-positive organisms including *Staphylococcus aureus* and *Bacillus subtilis* and Gram-negative pathogens such as *Escherichia coli*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. Ethanolic and methanolic extracts consistently show the highest zones of inhibition, indicating that alcohol-soluble constituents play a major role in antimicrobial efficacy. In addition to antibacterial activity, *S. china* exhibits notable antifungal effects, particularly against *Candida albicans*, *Aspergillus niger*, and *Fusarium* species, with polyphenolic-rich fractions demonstrating membrane-disrupting and enzyme-inhibitory actions. Mechanistic investigations suggest that its antimicrobial activity may involve alteration of microbial cell wall integrity, leakage of intracellular components, inhibition of essential microbial enzymes, and interference with protein and nucleic acid synthesis. Furthermore, the presence of bioactive compounds such as stigmasterol, β -sitosterol, diosgenin, and kaempferol derivatives is believed to enhance its antimicrobial potency. Taken together, the accumulated evidence strongly supports the traditional use of *Smilax china L.* for treating infections, wounds, and inflammation associated with microbial invasion, making it a

valuable medicinal plant with promising prospects for drug development and natural antimicrobial therapies.^[21, 22, 23, 24, 25]

Anti-viral activity

Emerging evidence suggests that *Smilax china L.* may also have antiviral potential, mediated largely through its phenolic constituents. In a seminal *in vitro* study, various extracts of *S. china* (ethanol, chloroform, ethyl acetate, butanol) as well as individual phenolics like resveratrol, dihydrokaempferol, and kaempferol-7-O-glucoside, were shown to significantly inhibit HIV-1 replication, with minimal cytotoxicity.^[26] More recently, a rhizome aqueous extract of *S. china* demonstrated strong inhibition (63–89%) of SARS-CoV-2 spike protein binding to the ACE-2 receptor, and among its bioactive compounds, Quercetin exhibited up to ~92% inhibition, indicating a promising mechanism to block viral entry. These preliminary data highlight the possibility of *S. china L.* as a natural antiviral agent, though more rigorous virological and *in vivo* studies are crucial to assess its therapeutic potential.^[27]

Analgesic and anti-nociceptive Activity

Extensive pharmacological studies have demonstrated that *Smilax china L.* possesses significant analgesic and anti-nociceptive properties, validating its traditional use in relieving pain, inflammation, and musculoskeletal discomfort. Early investigations showed that aqueous extracts of *S. china* markedly reduced pain responses in classical nociception models, including acetic acid-induced writhing and the formalin test, with high doses (500–1000 mg/kg) producing effects comparable to standard analgesics, indicating both peripheral and central pain-modulating effects.^[28]



In addition, fermented leaf extracts of *S. china* demonstrated strong anti-nociceptive activity by significantly increasing pain-threshold latency in the hot-plate test and inhibiting carrageenan-induced paw edema, suggesting a synergistic enhancement of both thermal analgesia and anti-inflammatory pathways through biotransformation of phytochemicals during fermentation.^[29] Phytochemical analyses further reveal that *S. china* contains high levels of flavonoids (Quercetin, kaempferol derivatives), stilbenoids (resveratrol, oxyresveratrol), saponins, and phenolic acids, all of which are known to contribute to analgesic activity via inhibition of cyclooxygenase (COX-2), suppression of prostaglandin synthesis, and down regulation of pain-associated inflammatory mediators. Moreover, antioxidant constituents in the plant help reduce oxidative stress linked to chronic pain states, providing an additional mechanism for analgesic action. Collectively, the available evidence supports that *Smilax china* L. exerts multi-mechanistic analgesic activity, involving modulation of inflammatory mediators, central nociceptive pathways, oxidative stress reduction, and enhancement of endogenous pain-control mechanisms, making it a valuable natural candidate for pain management and anti-inflammatory therapy.^[30, 31]

Anti-ulcer activity

Despite the widespread traditional use of *Smilax china* L. in various inflammatory and gastrointestinal ailments, scientific evidence supporting its ulcer-healing or gastric-protective properties is currently lacking. Limited non-peer-reviewed work suggests that stem extracts of *S. china* may have in vitro acid-neutralizing capacity, indicating potential anti-ulcer activity.^[32] (Santhi Priya et al., 2023). However, no well-designed in vivo studies (e.g., in animal models of gastric

ulcer) have been reported in the standard scientific literature. Given the known anti-inflammatory, antioxidant, and COX-inhibitory effects of *S. china* L., there is a strong rationale for conducting rigorous preclinical studies to evaluate its gastroprotective and ulcer-healing potential^[33, 34, 35]

Immunomodulatory activity

Recent studies have demonstrated that *Smilax china* L. possesses significant immunomodulatory activity mediated through multiple molecular pathways. For instance, showed that an ethanol extract of *S. china* markedly suppressed lipopolysaccharide (LPS)-induced production of pro-inflammatory cytokines IL-1 β , IL-6, and TNF- α in THP-1 cells by inhibiting the phosphorylation of MAPK family proteins (p38, JNK, ERK) and blocking nuclear translocation of NF- κ B.^[36] Moreover, it is demonstrated that *S. china* rhizome extract can reprogram tumor-associated macrophages from an M2-like (immunosuppressive) phenotype to an M1-like (pro-inflammatory) phenotype through ERK1/2 signaling, enhancing CD8⁺ T-cell infiltration and improving anti-tumor immunity in a mouse model. In addition, refined polysaccharides isolated from *S. china* (such as SCLP1 and SCLP3-2) were shown to inhibit nitric oxide (NO), IL-6, and TNF- α production in LPS-stimulated macrophages, acting via suppression of NF- κ B and MAPK pathways. Together, these findings suggest that *Smilax china* exerts its immunomodulatory effects by modulating both innate immune signaling and the macrophage activation state, making it a promising candidate for anti-inflammatory and anti-cancer applications.^[37]

Anti-obesity Activity

Several in vivo and in vitro studies support the anti-obesity potential of *Smilax china* L. For

example, it is demonstrated that dietary supplementation with a 0.5–1.0% *S. china* ethanol extract (SCLE) in high-fat diet (HFD)–fed mice significantly reduced body weight gain and adipose tissue accumulation. These effects were mediated through activation of AMPK, leading to suppression of lipogenesis (via SREBP-2) and enhancement of lipolysis (via ATGL, HSL) and β -oxidation (via CPT-1, ACO).^[38] In another study, a flavonoid-rich extract of *S. china* prevented obesity in mice on a high-fat/high-sucrose diet by up regulating adiponectin receptor (AdipoR1/2) signaling and activating AMPK α , down regulating lipogenic genes (SREBP-1c, FAS, ACC α), and increasing expression of PPAR α , CPT-1 α , and UCP-1, while also modulating gut microbiota to reduce energy absorption.^[39] Moreover, polyphenols isolated from *S. china* (SCP) significantly decreased insulin resistance, body weight, and inflammation in HFD mice, acting via IRS/AKT-AMPK and NF- κ B pathways. Together, these findings suggest that *Smilax china* may exert anti-obesity effects via a multi-pathway mechanism involving energy metabolism, fat synthesis and breakdown, and gut microbiota modulation.^[40]

Anti-osteoporotic activity

Recent evidence suggests that *Smilax china* L. exerts anti-osteoporotic effects by targeting osteoclastogenesis. Isolated a furostanol saponins, Chongrenside D (CGD), from *S. china* and showed that it potently inhibits RANKL-induced differentiation of bone marrow monocytes into osteoclasts in vitro. CGD suppressed key osteoclast marker genes, prevented actin-ring formation, and reduced bone resorption activity. In an in vivo model of LPS-induced bone loss, CGD administration preserved trabecular bone microarchitecture (increasing trabecular number and thickness while reducing separation), lowered

systemic inflammatory cytokines (IL-6, TNF- α), and reduced TRAP-positive osteoclasts in bone tissue. Mechanistically, the compound acts via down regulation of MMP-9 and inhibition of FAK–Src and MAPK signaling pathways, indicating its potential as a therapeutic for osteolytic diseases such as osteoporosis.^[41]

Angiogenic activity

Although direct studies on the pro-Angiogenic effects of *Smilax china* L. are scarce, there is evidence that its bioactive compounds significantly modulate endothelial function and matrix metalloproteinase, which are relevant to angiogenesis. For example, it is showed that kaempferol, kaempferol-7-O-rhamnopyranoside, puerarin, and ferulic acid (isolated from *S. china*) mitigated nicotine-induced endothelial dysfunction in HUVECs, inhibiting VCAM-1 and ICAM-1 expression and restoring eNOS activity, thus improving endothelial cell viability and function.^[42] Additionally, regulatory-type documentation reports that phenolic compounds from *S. china* stems can inhibit angiogenesis by down regulating MMP-2 and MMP-9 and reducing intracellular reactive oxygen species.^[43]

Anti-dermatitis activity

There is emerging evidence that *Smilax china* L. may have beneficial effects in inflammatory skin diseases such as dermatitis. For instance, a recent study found that a fermented preparation combining *S. china* extract and postbiotic metabolites (MB-2006) significantly reduced pro-inflammatory markers IL-4, TSLP, and TARC in a HaCaT keratinocyte model of atopic dermatitis, primarily through suppression of the NF- κ B pathway.^[44] In parallel, it is demonstrated that an ethanol extract of *S. china* (SCR) not only inhibited NO production, iNOS, COX-2, and pro-inflammatory cytokines (TNF- α , IL-1 β , IL-6)



in immune and skin cells, but also restored barrier-related proteins by up regulating filaggrin, involucrin, and loricrin, while reducing MMP-1.^[45] In addition, the antimicrobial potential of *S. china* against *Cutibacterium acnes*—a bacterium implicated in acne and skin inflammation—has been demonstrated, with compounds such as Quercetin, resveratrol, and oxyresveratrol showing potent activity.^[46] Finally, older work has also indicated anti-psoriatic effects of *S. china* rhizome extract in mice and in keratinocyte (HaCaT) cells. Together, these studies suggest that *S. china* has multi-faceted skin-protective activity: anti-inflammatory, barrier-enhancing, and anti-microbial, making it a promising candidate for managing dermatitis-like conditions.^[47]

Anti-fertility activity

In contrast to classical “anti-fertility” agents, *Smilax china* L. appears to support or restore reproductive health in the limited studies available. For instance, it is demonstrated that *S. china* administration in mercuric-chloride-treated male rats reduced histopathological damage in the testis and improved markers of spermatogenesis, suggesting a protective effect.^[48] Similarly, in a more recent mechanistic investigation, it is found that astilbin, a major flavonoid in *S. china*, attenuated fibrotic changes in human endometrial stromal cells induced by TGF- β through PI3K/AKT and NF- κ B signaling, indicating a potential role for *S. china* in treating intrauterine adhesions a condition that often causes infertility. Overall, current evidence does not support a contraceptive (anti-fertility) effect of *S. china*; rather, it might act to protect or restore reproductive tissues under stress or pathological conditions.^[49]

Cardio protective activity

Emerging pharmacological evidence indicates that *Smilax china* L. may exert cardioprotective effects, primarily via vascular and metabolic mechanisms. For example, it is demonstrated that compounds isolated from *S. china* (such as Caffeic acid, ferulic acid, and kaempferol) significantly up regulate endothelial nitric oxide synthase (eNOS) and suppress inflammatory adhesion molecules (VCAM-1, ICAM-1) in nicotine-challenged human endothelial cells, suggesting restoration of endothelial function.^[50] Additionally, a dietary supplement of *S. china* ethanol extract (SCLE) in high-fat diet-fed mice activated AMPK, down regulated cholesterol biosynthesis genes, and reduced plasma cholesterol levels.^[51]

Neuroprotective activity

Several studies provide compelling evidence that *Smilax china* L. exhibits neuroprotective effects via multiple mechanisms. For instance, it is demonstrated in a *Caenorhabditis elegans* Alzheimer’s model that *S. china* root extract delays β -amyloid-induced paralysis and reduces A β aggregation, likely through modulation of branched-chain amino-acid and fatty-acid metabolic pathways.^[52] In a Parkinson’s disease rat model (rotenone-induced), showed that *S. china* bark ethanolic extract improved motor behavior, increased brain antioxidant enzymes (e.g., SOD), and reduced α -synuclein accumulation and neuroinflammation.^[53] Moreover, it is reported that methanol extract of *S. china* rhizome protected cultured cortical neurons from NMDA-induced excitotoxicity by reducing calcium overload and ROS, and reduced cerebral infarct size in an ischemia model. These findings suggest that *S. china* may offer neuroprotection via antioxidant, metabolic, and anti-excitotoxic pathways, making it a promising candidate for neurodegenerative disease research.^[54]

Anti-androgenic activity



There is some preclinical evidence that *Smilax china* L. may exert anti-androgenic effects, particularly in the context of androgen-dependent prostate enlargement. In a testosterone propionate-induced benign prostatic hyperplasia (BPH) model in castrated rats, a macroporous-resin fraction (FMR) derived from *S. china* significantly reduced prostate weight and lowered serum dihydrotestosterone (DHT) levels, indicating suppression of androgenic signaling. Additionally, *S. china* is rich in steroidal saponins (furostanol-type), which have been structurally characterized; although these saponins have demonstrated anti-inflammatory effects in immune cells, their direct interaction with androgen receptors or androgen metabolism pathways remains to be clearly established. Overall, these data suggest a potential for *S. china* in modulating androgen activity, but further mechanistic studies are required to confirm receptor-level antagonism or enzyme inhibition (e.g., 5 α -reductase).^[55,56,57]

CONCLUSION

Smilax china Linn has demonstrated a wide array of pharmacological activities, reflecting its versatility as a medicinal plant. Studies have reported its various pharmacological activities. These activities are largely attributed to its diverse bioactive constituents, including flavonoids, saponins, phenolic compounds, and other secondary metabolites, which work synergistically to produce therapeutic effects.

The evidence indicates that *Smilax china* Linn can modulate multiple physiological pathways, suggesting its potential role in managing chronic diseases, infectious conditions, metabolic disorders, and inflammatory ailments. Moreover, both in vitro and in vivo studies support its traditional uses, while also providing a scientific basis for further exploration in modern

pharmacology. Despite the promising findings, mechanistic studies, standardization of extracts, dose optimization, and clinical trials remain limited and are necessary to fully validate its efficacy and safety.

In conclusion, *Smilax china* Linn represents a valuable natural resource for drug discovery and complementary medicine, offering potential therapeutic benefits across a wide spectrum of health conditions. Integrating traditional knowledge with rigorous scientific research could create the opportunity for developing novel formulations, enhancing its pharmacological applications, and promoting safe, evidence-based use in healthcare.

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