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Review

Cuscuta chinensis Lam.: A systematic review on ethnopharmacology, phytochemistry and pharmacology of an important traditional herbal medicine

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Kaempferol (PubChem CID: 5280863)
Isorhamnetin (PubChem CID: 5281654)
Astragalin (PubChem CID: 5282102)
Hyperoside (PubChem CID: 5281643)
Rutin (PubChem CID: 5280805)
Calycopteretin (PubChem CID: 10429470)
Cinnamic acid (PubChem CID: 444539)
Caffeic acid (PubChem CID: 689043)
p-coumaric acid (PubChem CID: 637542)

ABSTRACT

Ethnopharmacological relevance: Cuscuta chinensis Lam. has found its use as a traditional medicine in China, Korea, Pakistan, Vietnam, India and Thailand. It is commonly used as an anti-aging agent, anti-inflammatory agent, pain reliever and aphrodisiac. To provide an overview of the ethnopharmacology, phytochemistry, pharmacokinetics, pharmacology and clinical applications of *Cuscuta chinensis*, as well as being an evidence base for further research works of the plant.

Materials and methods: The present review covers the literature available from 1985 to 2014. The information was collected from journals, books, theses and electronic search (Google Scholar, PubMed, ScienceDirect, ESBCO, Springerlink and CNKI). Literature abstracts and full-text articles were analyzed and included in the review.

Results: Many phytochemicals have been isolated, identified and published to date, including: at least 19 flavonoids; 13 phenolic acids; 2 steroids; 1 hydroquinone; 10 volatile oils; 23 lignans; 5 alkaloids; 9 polysaccharides; 2 resin glycosides; 16 fatty acids. These phytochemicals and plant extracts exhibit a range of pharmacological activities that include hepatoprotective, renoprotective, antiosteoporotic, antioxidant, anti-aging, antimutagenic, antidepressant, improve sexual function, abortifacient effects, etc.

Conclusion: This present review offers primary information for further studies of *Cuscuta chinensis*. The *in vitro* studies and *in vivo* models have provided a bioscientific explanation for its various ethnopharmacological uses and pharmacological activities (most notably antioxidant effects) especially in the prevention of hepatic disease and renal failure. It is necessary and important to do more pharmacokinetic and toxicological research works on human subjects in order to inform the possible active compounds in the body and validate its safety in clinical uses.

Abbreviations: ALP, alkaline phosphatase; AMMC, amelanotic elanocytes; APAP, acetaminophen; ARF, acute renal failure; AST, aspartate aminotransferase; CCP, *Cuscuta chinensis* polysaccharides; CHO, cholesterol; CK, creatine kinase; CK-MB, creatine kinase muscle and brain (subunits); CMSD, *Cuscuta chinensis* with other 7 medicinal herbs; CNS, central nervous system; DC, dendritic cell; DMBA, 7,12-dimethylbenz(α)anthracene; DPPH, 2,2-Diphenyl-1-picrylhydrazyl; EC, 50% of effective concentration; ED90, 90% of effective concentration; EESC, ethanol extract of the dry seed of *Cuscuta chinensis*; ERα, estrogen receptor alpha; ERβ, estrogen receptor beta; FSC, Flavonoids from *Cuscuta chinensis* seeds; FST, force swimming test; H_2O_2, hydrogen peroxide; IC50, 50% of inhibition concentration; I.P., intraperitoneal; I.V., intravenous; LD50, 50% of lethal dose; LDH, lactate dehydrogenase; LF, Lipofuscin; LH, Luteininzing hormone; LPS, lipopolysaccharides; MDA, malondialdehyde; MI/RI, myocardial ischemia /reperfusion injury; P.O., per oral; OVA, ovalbumin; PCC, penile corpus cavernosum; PK, pharmacokinetics; ROS, reactive oxygen species; S.C., subcutaneous; SD rats, Sprague-Dawley rats; SOD, superoxide diamutase; TBHP, tertiary butyl hydroperoxide; TG, triglyceride; TST, tail suspension test

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Contents

1. Introduction

Cuscuta chinensis Lam. (*Cuscuta chinensis*; Convolvulaceae, (The Plant List., 2013)) is a parasitic plant which is also known as Chinese Dodder (Mavlonov et al., 2008), or Tu-Si-Zi in Chinese (Flora of China, 2006). It is commonly used in traditional medicine as a tonic and aphrodisiac in China and other Asian countries. It is often used as a functional food by adding to alcoholic beverages or porridge to improve sexual potency and vision and prevent abortion (Zheng et al., 1998).

Cuscuta chinensis has two synonyms (*Cuscuta. carinata* R. Br. and *Cuscuta. chinensis* var. *carinata* (R. Br.) Engelm) (The Plant List., 2013). No articles were found after searching by using these two names. However, it was found that *Cuscuta chinensis* Lam. was used in 80 reports (both in English and Chinese articles including 35 plant-authorized articles) and was not used in 17 Chinese articles in which the plant was just defined as Tu-Si-Zi. *Cuscuta chinensis* Lam. should be used instead of Tu-Si-Zi in all publications in the future.

Cuscuta chinensis (Fig. 1) is a parasitic plant that wraps around other plants and uses them for its nourishment. The plant grows near seaside. *Stems* thin, twining, filiform, glabrous, yellowish or pale yellowish, ca. 1 mm diam. The plant has no leaf or reduced to minute scales. The flowers are hermaphrodite. *Inflorescence* lateral, compact cymose glomelurous, few to many flowered clusters or racemes, white; bracteoles scale-like and bracts. Pedical ca. 1 mm. *Calyx* lobe 4–5, capular, sepals triangular ovate ca. 1.5 mm, ridged on outer surface, apex obtuse, partly thickened. *Corolla* 3–3.5 mm long, white, urceolate, 4 or 5 lopes, lopes detoid-ovate, apex acute or obtuse, spreading horizontally, fimbriate, reflexed, infrastaminal scales shorter than tube. *Stamens* anthers ovoid, exserted. *Ovary* subglobose, locues 2, ovules 4, styles 2, slender. *Stigmas* globose, capitates. *Capsules* globose, ca. 3 mm wide, enclosed by persistent corolla; pericarp thin, circumscissile. The seeds 2–4, broadly ovalate, 1–2 mm long, pale brown, not smooth. Flowering in June–October; December–March; February–May and fruits in August–October. It can grow in semi-shade (light woodland) or no shade and requires moist soil. It is often on the plants of Fabaceae, Asteraceae, and Zygophyllaceae. *Cuscuta chinensis* is distributed in Africa: Ethiopia; Middle Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan; Mongolia; Russia; China; Western Asia: Iran, Iraq, Afghanistan; Tropical Asia: India, Sri Lanka; Indonesia; Eastern Asia: Korea, Japan, Taiwan, Thailand; Australasia. It is distributed in most parts of China mainly in Henan, Jiangsu, Shandong, Hebei, Jilin, Liaoning provinces and

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