



Traditional uses, constituents and pharmacological effects of *Cuscuta planiflora*

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Abstract In traditional Chinese and Japanese medicine, the seeds of the dodder (*Cuscuta planiflora*) are often harvested and ground into a fine powder, which was then made into tablets or encapsulated and taken to treat osteoporosis, osteoarthritis, general muscular pains. Dodder was employed in Ayurveda as a remedy for jaundice, as a mild laxative and a moderately potent analgesic. The preliminary phytochemical screening showed that *Cuscuta planiflora* contained polyphenols, flavonoid, glycoside, alkaloids, carbohydrates, saponins, glycosides, phytosterols, triterpenoids and steroids. The previous pharmacological investigation showed that *Cuscuta planiflora* possessed antidepressant, anticonvulsant, antibacterial, cytotoxic and hepatoprotective effects. This review was designed to highlight the chemical constituents and pharmacological effects of *Cuscuta planiflora*.

Keywords Constituents, Pharmacology, *Cuscuta planiflora*

Introduction

The World Health Organization (WHO) estimates that 4 billion people, 80 percent of the world population, presently use herbal medicine for some aspect of primary health care [1]. Plant showed wide range of pharmacological activities including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic antipyretic and many other pharmacological effects [2-21]. In traditional Chinese and Japanese medicine, the seeds of the dodder (*Cuscuta planiflora*) are often harvested and ground into a fine powder, which was then made into tablets or encapsulated and taken to treat osteoporosis, osteoarthritis, general muscular pains. Dodder was employed in Ayurveda as a remedy for jaundice, as a mild laxative and a moderately potent analgesic. The preliminary phytochemical screening showed that *Cuscuta planiflora* contained polyphenols, flavonoid, glycoside, alkaloids, carbohydrates, saponins, glycosides, phytosterols, triterpenoids and steroids. The previous pharmacological investigation showed that *Cuscuta planiflora* possessed antidepressant, anticonvulsant, antibacterial, cytotoxic and hepatoprotective effects. This review was designed to highlight the chemical constituents and pharmacological effects of *Cuscuta planiflora*.

Plant profile

Synonyms

Cuscuta planiflora Ten., *Cuscuta planiflora* var. *ambigua* (Trab.) Yunck., *Cuscuta planiflora* subsp. *approximata* (Bab.) H. Lindb., *Cuscuta planiflora* var. *approximata* (Bab.) Engelm., *Cuscuta planiflora* var. *callosa* (Pomel) Trab., *Cuscuta planiflora* var. *episonchum* (Webb & Berthel.) Trab., *Cuscuta planiflora* var. *vargodronii* (Des Moul.) Rouy, *Cuscuta planiflora* var. *Madagascarensis* (Yunck.) Verdc., *Cuscuta planiflora* var. *mossamedensis* Welw. ex Hiern, *Cuscuta planiflora* var. *papillosa* Engelm., *Cuscuta planiflora* var. *planiflora*, *Cuscuta planiflora* var. *schiraziana* (Boiss.) Engelm.,



Cuscuta planiflora var. *sicula* (Tineo ex Engelm.) Trab., *Cuscuta planiflora* var. *tenorii* Engelm. and *Cuscuta planiflora* var. *webbii* Engelm, *Cuscuta epithymum* subsp. *planiflora* (Ten.) Rouy [22-23].

Taxonomic Classification

Kingdom: Plantae, **Phylum:** Tracheophyta, **Class:** Spermatopsida, **Subclass:** Asteridae, **Order:** Solanales, **Family:** Convolvulaceae, **Genus:** *Cuscuta*, **Species:** *Cuscuta planiflora* [24-25].

Common Names

Arabic: Hamoul, Shubbak, Dabaie, **English:** Small-seed dodder, Alfalfa dodder; **French:** Cuscute à fleurs planes, Cuscute à petites fleurs; **Germany:** Klee- Seide; Ouendel-Seide; Thymian-Seide; **Italy:** *Cuscuta del trifoglio*; *Cuscuta piccolo*; **Portuguese:** Cipó-de-chumbo, Espaguete; **Spanish:** *Cuscuta del trebol*, Epiteimo [26].

Distribution

Small-seeded dodder was a native to the Mediterranean region and became naturalised in more than forty countries. However the plant was distributed in: **Africa** (Algeria, Egypt, Libya, Morocco, Tunisia, Eritrea, Ethiopia, Kenya, Tanzania, Uganda, Burundi; Rwanda, Zaire, Angola, Zambia, Zimbabwe, Namibia, South Africa); **Asia** (Kuwait, Afghanistan, Iraq, Egypt, Iran, Palestine, Jordan, Lebanon, Syria, Saudi Arabia, Yemen, Bahrain, Turkey); **Europe** (Albania, Bulgaria, Former Yugoslavia, Greece, Italy, Romania, France, Portugal, Spain) and **Australia** [26-28].

Description

Small-seeded dodder has yellowish or crimson, twining, terete stems up to 0.3 mm wide, with leaves absent or reduced to minute scales. Subsessile, 5- (or rarely 4-) merous flowers form in a compact inflorescence and are up to 3 mm long, whitish and somewhat fleshy. The calyx is broadly campanulate with obtuse or acute, fleshy or turgid lobes and almost encloses the corolla tube. The corolla is broadly campanulate to globose, with slightly obtuse, spreading lobes that may be turgid or membranous at the apices. Within the corolla tube, the stamens are subtended by fimbriate scales, which almost reach the stamens or are shorter. Scales are fringed, usually oblong and/or bifid and bridged low down or at the middle. Stamens are shorter than the corolla lobes with filaments that may or may not be equal in length to the anthers. The two styles may be longer or shorter than the subulate stigmas, and are slender above a globose, two-celled ovary. The capsule is depressed-globose, splitting around the base. The four ovoid, granulate seeds are mostly shorter than 1 mm [27, 29-30].

Traditional Uses

In traditional Chinese and Japanese medicine, the seeds of the dodder are often harvested and ground into a fine powder, which was then made into tablets or encapsulated and taken to treat osteoporosis, osteoarthritis, general muscular pains. It has even been given as a substitute for calcium supplements in individuals who suffer from low bone density, along with a prescribed dietary regimen for several months up to several years, with extreme attention paid to the dosage, as the seeds of dodder, if consumed in very large quantities, can be hepatotoxic. Dodder was employed in Ayurveda as a remedy for jaundice, as a mild laxative and a moderately potent analgesic. When steeped in jaggery or honey, it was also given as a remedy for cough, boils (applied topically), and as a daily tonifying medicine, to boost the overall immune system if consumed moderately [31-32].

Chemical Constituents

The preliminary phytochemical screening showed the presence of flavonoid, glycoside, alkaloids, carbohydrates, saponins, glycosides, phytosterols, triterpenoids and steroids in the plant extract [33-34]. The plant also contained polyphenols and flavonoids [35]. Total phenolic contents of the extracts were determined by Folin-Ciocalteu method. The poly-phenolic content of the hydroalcoholic and chloroform extracts were 10.64 ± 0.86 and 4.81 ± 0.38 , respectively [36].



Pharmacological Effects

Antidepressant Effect

The effects of *Cuscuta planiflora* (500mg capsules) were evaluated in patients with major depression by a randomized triple-blind controlled clinical trial. Patients were taken the treatment for 8 weeks. Depression was measured before and after the study by Beck depression inventory and Hamilton depression inventory. There was a significant decrease in mean scores of Beck and Hamilton depression inventories in the group treated by *Cuscuta planiflora* ($p < 0.01$) compared with control [37].

Anticonvulsant Effect

The anticonvulsant effect of 80% methanol extract of the plants was investigated in pentylenetetrazole induced seizure in mice. Different doses of extracts delayed the onset of seizure ($p < 0.01$), but the duration of seizure did not change significantly. Pretreatment of animals with different doses of extracts decreased the mortality rate significantly ($p < 0.01$), the percent of seizure protection was also greater than control group significantly ($p < 0.05$). The most effective dose was 50 mg/kg [38].

Antibacterial Effect

The antibacterial effect of the methanol extract of the plant showed moderate antibacterial activities against *Bacillus megaterium*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Salmonella typhi* with MIC values of 4.96 ± 0.20 , 3.03 ± 0.16 , 3.47 ± 0.20 and 4.07 ± 0.08 mg/ml, respectively [33].

Cytotoxic Effect

The minimum inhibitory concentration and cytotoxic activities of the methanolic extract were carried out using broth dilution assay and brine shrimp lethality bioassay. The methanol extract showed lethality against brine shrimp nauplii (LC_{50} was $36.31 \mu\text{g/ml}$ and LC_{90} was $83.18 \mu\text{g/ml}$) [33].

The cytotoxic effects of chloroform and hydroalcoholic extracts of the plant was evaluated on human breast carcinoma cell line (MDA-MB-468), human colorectal adenocarcinoma cell line (HT29) and human uterine cervical carcinoma (Hela). Using maceration method, different extracts of aerial parts of the plant were prepared. Extraction was performed using chloroform and ethanol/water (70/30). The results showed that the hydroalcoholic extracts of *C. epithymum* only significant decreased the viability of MDA-MB-468 cells ($IC_{50} = 340 \mu\text{g/ml}$) [36]. The *in vitro* antioxidant potential of methanolic extract was evaluated by DPPH, hydroxyl and superoxide radical scavenging assays. The radical scavenging activity was found to be concentration dependent and increased with increasing concentrations and produced maximum scavenging activity at a dose of $360 \mu\text{g}$ [39].

Hepatoprotective Effect

The *in vivo* hepatoprotective activity of methanolic extract of whole plant was studied in carbon tetrachloride (CCl_4) induced hepatotoxicity animal model using albino rats. The results showed that, the methanolic extract exerted significant hepatoprotective activity against CCl_4 induced hepatotoxicity by suppressing CCl_4 induced cellular oxidative stress. Furthermore, these results confirmed by enzymatic and histological study [34].

Conclusion

This review discusses the chemical constituent, pharmacological and therapeutic effects of *Cuscuta planiflora* as promising herbal drug because of its safety and effectiveness.

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