A review on a parasitic plant ‘cuscuta reflexa Roxb.’ for its traditional and Pharmacological uses.

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Abstract: The Cuscuta reflexa Roxb. plant is known for its diverse traditional uses in many diseases. C. reflexa has many medicinal properties for effective management against various diseases, such as antioxidant, antiulcer, antispasmodic, effective in jaundice and many more. The plant is having economically very important in the near future in the pharmaceutical industries. The Cuscuta reflexa as phytomedicine brings us many medicinal importance against the ailments of the body. The phytomedicines are employed to the population by analysing its safety and efficacy. Here, we use to review for the Phytochemicals reported and pharmacological effects of the Cuscuta reflexa Roxb. This review will try to reflect the information of the plant in accordance to the disease in the body as a remedy.

Keywords: Cuscuta reflexa Roxb., traditional uses, phytochemicals, pharmacological activities.

INTRODUCTION

According to WHO, about 70% to 95% of population in a majority of developing countries still depends on traditional medicine as their remedy for various diseases. People use plants due to their various therapeutical properties against inflammation, allergic, oxidation, microbial infection, diabetes, ageing and more. The various pharmacological effects and properties of the plant is studied broadly in a newly emerged category of drug called as phytopharmaceutics or phytomedicines. Phytomedicine brings new lead drug discoveries and phytopharmaceuticals assures the people for its safe and efficacious use of plant-based medicinal products. Plant sources act as a new lead compound provider due to the various chemical entities present in them. [1] The plants produce Secondary metabolites, of which total of 15000 have been isolated, that is less than 10% of the total secondary metabolites produced by plants. These secondary metabolites act as plant’s defence mechanism against various microorganisms, insects, herbivores and also effective for animals against various diseases or disorders.

Cuscuta reflexa Roxb

It is a plant used to grow on other plant by climbing and curling around them like a twiner and sucking the necessary nutrients from the host plant via attaching its organ called haustoria to the host. It is categorised as an Angiospermic plant and is a holoparasite. It belongs to family Convolvulaceae having genus Cuscuta and species reflexa. Cuscuta is a group of 100- 170 species. Cuscuta is found at the temperate and in tropical regions of the world with good amount of species diversity in tropical and subtropical regions.[2]. It is known to parasite majority of the angiosperms. It is also known as Amarbel (Immortal twine), Akashwell (Sky winner), Swarnlata, Akakhilata. Other names include Hell weed, Devils gut, Begger weed, Scald weed, Dodder of thyme, Greater dodder Lesser dodder[3]

BOTANICAL CLASSIFICATION

Taxonomical classification

Kingdom Plantae
Subkingdom Tracheobionta
Super division Spermatophyta
Division Angiosperms
Class Eudicots
Subclass Asterids
Order Solanales
Family Convolvulaceae
Genus Cuscuta
Species reflexa Roxb.

VERNACULAR NAMES[4]

<table>
<thead>
<tr>
<th>Language</th>
<th>Name</th>
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<tbody>
<tr>
<td>English</td>
<td>Dodder Plant</td>
</tr>
<tr>
<td>Hindi</td>
<td>Amarabela</td>
</tr>
<tr>
<td>Sanskrit</td>
<td>Akasavalli, Amaravalli, Khavalli</td>
</tr>
<tr>
<td>Punjabi</td>
<td>Zarbut</td>
</tr>
<tr>
<td>Urdu</td>
<td>Akashbel</td>
</tr>
<tr>
<td>Bengali</td>
<td>Akashbel</td>
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</tbody>
</table>

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MORPHOLOGICAL CHARACTERISTICS

a) Stem: The stem is highly branched and vegetative during favourable conditions. It is a twiner, Weak, pale-green, develop haustoria at the point of contact with the host plant. The main organs of the stems are vascular bundles (xylem and phloem), meristem, pith, etc. The main secondary metabolites are also present in it, like, terpenoids, carbohydrates, fats, flavonoids, etc.

b) Haustoria: It is a special organ developed as a result of the evolution in the plants. It has two main stages on the basis of its maturity on the host plant body. Further developed into haustoria hairs. These are hair like projection which ultimately enters into the host body.

c) Flowers: The flowers are very distinct in shape and also small as compared to the other genus of Cuscuta species. It has 5 petals and four lobes, Bracteate, ebracteolate, hermaphrodite, actinomorphic, pentamerous, small, pale-green. Further, Gynoecium: Style is very much reduced, disc red coloured, 2 carpels, syncarpous, superior, bilocular.

Carps: The carpels are Medially placed, 2 or more ovules in each locule, axile placentation stigma bifid and hairy, a nectareous disc is present below the ovary.

Androecium: Here mainly 5 stamens, epipetalous, filaments are of different sizes dorsifixed, alternipetalous.

Corolla: There are total of 5 petals, united, campanulate, valvate, with 5 coronary outgrowths at the base corolla.

Calyx: There were 5 sepals, fused, valvate.

d) Seed: These are small were having hard coat which helps them to survive many harsh seasons and climates. The seeds are viable for a very long period of time.

Image of C. reflexa stem(a) and flower(b)

GEOGRAPHICAL DISTRIBUTION

*Cuscuta reflexa* Roxb. occurs throughout the India. This species is common over the northern region of country, Bengal plains, Western ghats, Satara region, Himachal Pradesh, Uttar Pradesh and Uttarakhand. It is also found in plain of Afghanistan, Malaysia, Nepal and Thailand.

FAVOURABLE AND HIGHLY FREQUENT HOSTS OF THE CUSCUTA PLANT:

The *Cuscuta reflexa* mainly parasitise all the angiospermic plants. The highly frequent host plants are given in the table below. The hosts include ephemeral, annual, biennial and perennial life span; herb, shrub, climber, liana and tree habits; and agricultural, horticultural, medicinal, weeds, forest and economically important plants. Cucurbita moschata (Cucurbitaceae)[6], Jatropha curcas (Euphorbiaceae), Parthenium hysterophorus (Asteraceae), Vitex negundo (Verbenaceae), Oryza sativa (Poaceae), Justicia adhatoda (Acanthaceae), Datura metel (Solanaceae), Acacia catechu (Mimosaceae), Mangifera indica (Anacardiaceae), Ficus bejamina (Moraceae), Lantana camara (Verbenaceae), Calotropis gigantea (Apocynaceae), Bambusa tulda (Poaceae), Azadirachta indica (Meliaceae)[7], etc.

PHYTOCONSTITUENTS REPORTED IN CUSCUTA REFLEXA ROXB.

Based on the characteristic, each type of *Cuscuta* sp., have different type of phytochemical identity. Diverse types of phytocomponents have been isolated from the *Cuscuta reflexa* plant based on the host and plant nutrition.[8] Most of the phytochemicals are listed below which were reported so far in the plant *Cuscuta reflexa*. They were mainly alkaloid, flavonoids, phenols, glycosides, terpenoids, etc. [9] The various chemical constituents are present in various extracts obtained from the plant and so the plant exhibits various pharmacological activities like antioxidant, antibacterial, antidiabetic, anticarcinogenic, antispasmodic, effective in jaundice, etc.[10,11]

<table>
<thead>
<tr>
<th>Chemical Constituents</th>
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<tbody>
<tr>
<td>Quercetin,</td>
</tr>
<tr>
<td>Hyperoside,</td>
</tr>
</tbody>
</table>
Kaempferol,  
Myricetin,  
Quercetin 3-O-neohesperidoside,  
Leuteolin,  
Quercetin-3-O-glucoside,  
3,5,7,3’-pentahydroxy flavanone (taxifolin Reflexin,  
5-hydroxy-7-methoxy-6-(2,3-epoxy-3-methylbutyl)-flavanone  
Kaempferol-3-O-glucoside,  
Myricetin-3-O-alpha-rhamnoside  
Apigenin-7-b-rutinoside  
3’-methoxy-3’,4’,5,7- tetrahydroxy flavone,  
3’-methoxy-4’,5,7-trihydroxy flavone-3-glucoside  
Myricetin-3- glucoside,  
6,7,8- Trimethoxy 2H-1-benzopyran-2-one,  
4,4’,6-Trihydroxyauran,  
Chlorogenic acid,  
Taxifolin 7-O- b D- glucopyranoside  
Methylcytisine,  
Laceeroic acid  
Lupanine,  
3,4-Di-O-caffeoylquinic acid  
4-oic acid-7-oxo-kaurene-6 alpha-O- b D-glucoside  
Cuscutoside-A  
Caffic acid  
21-Hydroxy odoroside H  
Odoroside H  
Stigmast-5-en-3-O-b-D-glucopyranoside b  
Stigmast-5-en-3-yl-acetate  
Campesterol  
Sesamin  
Gitoxigenin  
Stigmasterol  
Lupeol  
Oleanolic acetate  
Alpha – Amyrin  
Beta – Amyrin  
Alpha Amyrin Acetate  
Beta Amyrin Acetate  
Hydroxyoleanane  
Maragenin  
Aromandendrin  
Ursolic acid  
Carotene  
Lutein  
Lycopene  
Violaxanthin  
Rubixanthin

**STRUCTURES OF CHEMICAL CONSTITUENTS**

The chemical structure of some of the basic phytochemicals reported in the *Cuscuta reflexa* Roxb.

<table>
<thead>
<tr>
<th>Name of compound</th>
<th>Chemical structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quercetin</td>
<td><img src="image" alt="Quercetin Structure" /></td>
</tr>
</tbody>
</table>
### TRADITIONAL USE OF CUSCUTA REFLEXA PLANT

The plant species is most frequently used for the treatment of jaundice.

<table>
<thead>
<tr>
<th>s.no.</th>
<th>part</th>
<th>Type of dosage form</th>
<th>Tradition use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Whole plant</td>
<td>Paste</td>
<td>Treatment of swollen testicles, gout and joint pain, causes abortion, anti-rheumatic, analgesic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maceration</td>
<td>Infection treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infusion</td>
<td>Anti-poisonous</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Juice</td>
<td>Antiseptic, useful in itching skin and jaundice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pills</td>
<td>Anti-tuberculosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Powder</td>
<td>Anti-fertility agent, astringent, diaphoretic.</td>
</tr>
<tr>
<td>2</td>
<td>stem</td>
<td>Decoction</td>
<td>Hepatoprotective, antidiarrheal, useful in constipation, stomach disorders, urinary tract infections, jaundice, epilepsy, cholera, asthma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paste</td>
<td>Anti-hair fall, anti-rheumatic, useful in skin diseases</td>
</tr>
</tbody>
</table>
When taken internally it treats the retention of urine while being applied externally for skin itches. It is also used to cure the cough and diabetes, eczema abortifacient, cholinergic action, anti-steroidogenic activity, hepatoprotective activity, diuretic activity, anticonvulsant activity.

1. **Hepatoprotective Activity**: The methanolic extracts of *C. reflexa* is evaluated for hepatoprotective activity on carbon tetrachloride induced hepatotoxicity in liver histopathology and alteration in certain biological parameters was observed.[48]

2. **Antitumor Activity**: The Chloroform and ethanol extracts is having antitumor activity reported against Ehrlich ascites carcinoma tumour in mice. [49,50]

3. **Antioxidant Activity**: The Ethyl acetate and ethanol extract of the plant showed higher activity than other fractions, and very close and identical in the magnitude and comparable to the standard antioxidant agents.[51]

4. **Antibacterial Activity**: An ethanolic extract of *Cuscuta reflexa* showed antimicrobial activity against *E. coli* and *S. Sonnei*. Plant also shows antimicrobial activity against different microorganisms like, *Staphylococcus epidermidis*, *Staphylococcus aureus*, *E. coli*, *Micrococcus luteus*, *Pseudomonas aeruginosa*.[52]

5. **Hypoglycaemic activity**: A Methanolic extract showed significant inhibition against α-Glucosidase.[53,54]

6. **Effect on blood pressure**: Alcoholic extract of *Cuscuta reflexa* have positive inotropic and cardiotonic activities on the perfuse frog heart. Series of experiments on dog results in the fall in blood pressure.[55]

7. **Relaxant and spasmylytic action**: An Aqueous and alcoholic extracts showed relaxant and spasmylytic action on small intestine of guinea pig and rabbit.[19]

8. **Diuretic Activity**: An Aqueous and alcoholic extracts of *C. reflexa* showed diuretic activity in Wistar rat.[2]

9. **Anti-diabetic activity**: The methanol and aqueous *C. reflexa* has significant antidiabetic effects and also improves metabolic alterations.[56]

10. **Hair growth activity**: Petroleum-ether and ethanolic extract of *C. reflexa* is given and hair growth is observed in male swiss albino rats. *C. reflexa* extract is useful in the treatment of alopecia. This study showed us that it is capable of promoting follicular proliferation or preventing hair loss in cyclophosphamide-induced hair fall in In-vivo conditions.[57]

11. **Anti-inflammatory and Anti-carcinogenic activity**: In different phases of pathogenesis of cancer, inflammatory reactions play a vital role for the stoppage of cancer from spreading. In Invitro and In-vivo tests, aqueous and alcoholic extracts of stem of *C. reflexa* and its ethyl acetate fraction showed remarkable anti-inflammatory activity. *C. reflexa* significantly suppressed inflammation by reducing the volume of water in the body up to 80% in rats.[58,59]

12. **Anti-fertility effect**: Methanolic extract brings back the normal oestrus cycle and decrease the ovarian and uterus weight in adult female mice.[60]

**CONCLUSION**
*C. reflexa* is a holoparasitic and it depend on nutrients, water and carbohydrates from other host plants. *Cuscuta* species lack roots or leaves but possess specific penetrating organs, called haustoria, which are fully developed in 5–6 days after the first contact with host body. The plant is employed in Ayurvedic medicine to treat difficulty in urinating, jaundice, muscle pain and coughs. The juice of the plant, mixed with the juice of Saccharum officinarum or coconut water is used in the treatment of jaundice. The phytoconstituents such as flavonoids, alkaloids, glycosides, steroids, volatile oils and resins are encountered as imp.

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