

Cleome viscosa Linn (Capparaceae): A Review

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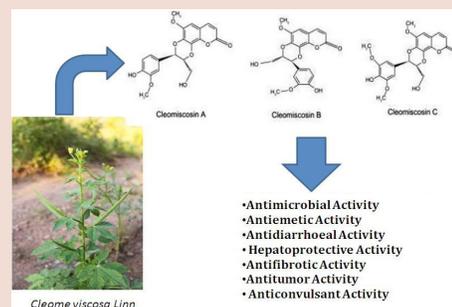
ABSTRACT

Cleome viscosa Linn. (Capparaceae) called as "Hurhur" is an annual, sticky herb found in plains of India, Africa, and Pakistan etc as a common weed. Plant and its parts (leaves, seeds, roots etc.) are used traditionally to cure variety of diseases. Traditionally the plant possess anthelmintic, carminative, anticonvulsant, antidiarrhoeal, antimicrobial, wound healing properties. The review shows that various phytochemical compound were isolated from whole plant and its parts (seeds, leaves, roots etc.). The review reveals the collection of important pharmacological activities like antimicrobial, analgesic, antiemetic, antidiarrhoeal, hepatoprotective, antifibrotic, antitumor, anticonvulsant and psychopharmacological. It also made emphasis on its application in biodiesel formation. The review draws attention towards the traditional, phytochemical and pharmacological knowledge accessible on *Cleome viscosa* Linn. which would be beneficial for researchers to discover novel chemical entities.

Key words: Anticonvulsant, Biodiesel, Cleomiscosin, *Cleome viscosa* Linn., Phytochemical, Psychopharmacological.

SUMMARY

- A number of phytochemicals isolated from various parts (root, stem, leaf and seed) of *Cleome viscosa* Linn have been reported. Out of them, terpenes, flavonoids, phenol carboxylic acid are major category. The coumarin, cedrene, α -amorphene, ethyl palmitate, coumarinolignoids (Cleomiscosin A and B), and Eriodictyol-5-rhamnoside as chief pharmacologically active principle.
- *Cleome viscosa* Linn has been explored in a wide range of pharmacological activities such as antimicrobial, antiemetic activity, antidiarrhoeal, hepatoprotective, antifibrotic, antitumor, anticonvulsant and miscellaneous activities. Its anti-convulsant potential has been reported as prominent activity.



PICTORIAL ABSTRACT

Abbreviations used: MES: Maximal Electroshock, PTZ: Pentylene-tetrazole, GC: Gas Chromatography, GC-MS: Gas Chromatography-Mass Spectroscopy.

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INTRODUCTION

From old age, plants are used as crude material for drugs. In India, rich knowledge of medicinal importance of plants is available to the common people. About 3,500 plant species are useful as a source of crude drug in India. Medicinally important plants are about 2,500 in number. Some plant species are considered as a weed, but they are also medicinally important too. In various traditional and modern methods of therapy, plants products are used. In current era, the trend of using herbal medicine is in scope. New drugs are discovered by the invention of modern biotechnological and bioinformatics techniques.¹ In current era, herbal medicines are used more often as human believe in natural therapies is increasing day by day. Novel clinically active drugs are discovered from the natural products isolated from higher plants and microorganisms.² *Cleome viscosa* Linn. (wild or dog mustard), family (Capparaceae) is a sticky herb found as a common weed in plains of Pakistan, India, China, Ceylon, Africa etc and throughout the tropical regions of world annually. In traditional system of medicine leaves, seeds and roots of the plant are widely used as an anthelmintic, antiscorbutic, antiseptic, cardiac stimulant, carminative, febrifuge and sudorific, anticonvulsant, antidiarrhoeal, and are also used to treat skin diseases.³ It is called as 'Hurhur' in India. Traditionally *Cleome viscosa* Linn. plant is an antimalarial drug and useful in blood diseases, uterine complaints also. The pungent seeds and seed pods are used as a mustard substitute in curries.⁴

Biological Description and Taxonomy

Cleome viscosa Linn. is an annual, erect, 30-90 cm high plant. Stem of plant is grooved, densely clothed with glandular and simple hairs. Leaves of the plant are 3-5 foliolate. Lower leaves petioles are 2.5-5 cm long gradually becoming shorter upwards. The bracts are subsessile. Leaflets are elliptical-oblong or obovate, acute or obtuse. Petioles are short and hairy. Flowers are yellow in colour, axillary, growing out into a lax raceme. Pedicels are slender, terete and hairy. Sepals are 4.5 cm long oblong-lanceolate, glandular-pubescent outside. Petals are oblong-obovate, about 12 mm long, veined. Stamens are more than 20 in number. Capsules 5-6.3 by 0.4 cm., erect, hairy, obliquely striate, compressed, tapering towards both ends, terminated by a style 3 mm. long. Seeds are brown-black in colour when ripe, finely transversely striate, subglobose (Figure 1).⁵

Classification

Kingdom:	Plantae
Subkingdom:	Tracheobionta
Superdivision:	Spermatophyta
Division:	Magnoliophyta
Class:	Magnoliopsida
Subclass:	Dilleniidae



Figure 1: *Cleome viscosa* Linn Plant³

Order: Capparales
 Family: *Capparaceae*
 Genus: *Cleome* Linn.
 Species: *Cleome viscosa* Linn

Distribution

Cleome viscosa Linn. occurs throughout the tropical regions of world. It occurs in India, USA, Nigeria, China, Ceylon, Pakistan, Africa.³

Phytochemistry

To isolate and characterize compounds, phytochemical work has been performed on various parts of the plant (root, stem, leaf and seed). Preliminary phytochemical screening of the extracts was performed and it was reported that terpenes, flavonoids, phenol carboxylic acid, polyphenols were present.² It has been reported that monoterpenes hydrocarbons, sesquiterpenoids, oxygenated derivatives were isolated from leaves, seeds and root extracts. Compounds identified by Gas chromatography (GC), Gas chromatography/mass spectrometry (GC-MS),¹ H NMR in leaves extract of *Cleome viscosa* Linn. were Heptane-4-one, α -pinene, camphene, dehydrosabene, 6-Methylhept-5-ene-2-one, β -pinene, myrcene, *p*-cymene, limonene, E-ocimene, α -tepeniol, allo-ocimene, citronellic acid, coumarin, cedrene, α -amorphene, ethyl palmitate. Oct-1-ene, α -pinene, β -pinene, myrcene, *p*-cymene, E-ocimene, dehydrolinalool, undecan, allo-ocimene, limonene oxide, α -tepeniol, Decan-2-ol, citronellic acid, Deca-2,4-dien-1-al were identified in roots extract. In seeds extract, Oct-1-ene, Heptane-4-one, Heptane-2-one, Non-1-ene, α -pinene, dehydrosabene, 6-Methylhept-5-ene-2-one, E-ocimene, myrcene, *p*-cymene, limonene, dehydrolinalool, undecan, limonene oxide, α -tepeniol, benzoic acid, Deca-2,4-dien-1-al, Decan-2-ol, Gerniol, Undec-10-e-1-al, coumarin were detected.⁶ Viscocic, viscosin (monomethoxy trihydroxyflavone) were identified in seeds.⁷ Eriodictyol-5-rhamnoside (Novel glycoside) has been isolated from whole plant.⁸ Cleomiscosin A and B were detected in seeds extracts.⁹ Glu-cocapparin and glucocleomin (glucosinolates)¹⁰ and cleomaldeic acid ((3E, 7E, 11E) 20-oxocembra-3, 7, 11, 15-tetraen-19-oic acid) a macrocyclic diterpene have been separated from whole plant.¹¹ Some of the phytoconstituentms are presented in Table 1.

Pharmacological Activity

In view of its traditional claim in literatures, researchers have focused on its pharmacological screening. Out of all the activities reported, some important activities are explained in this manuscript as:

Antimicrobial Activity

The antimicrobial study was performed on various extracts of *Cleome viscosa* Linn. seeds. Eight microbial species were used. Petroleum ether

Table 1: Important Phytoconstituents of *Cleome viscosa* Linn⁸⁻¹⁰

Phytoconstituent	Structure
Cleomescin	
Cleomaldeic acid	
Cleomiscosin A	
Cleomiscosin B	
Cleomiscosin C	

extract, chloroform extract, ethyl acetate extract, ethanol extract and aqueous extract of *Cleome viscosa* Linn. seeds were screened against these eight microbial species. Clinical samples of pus from ear ache patients were also used. The test materials have shown significant antimicrobial activity. The zones of inhibition were found to be between 10 mm to 17 mm. The Minimum inhibitory concentration (MIC) values of extracts were also determined against microorganism which ranges from 0.1 to 0.45.¹²

Analgesic Activity

A study was performed to evaluate the analgesic effect of *Cleome viscosa* Linn. in experimental animal models. The number of writhes were decreased at doses (75 mg/kg body weight, 100 mg/kg body weight, 125 mg/kg body weight) of *Cleome viscosa* Linn. seeds fixed oil when compared to aspirin treatment and the control. Fixed oil in doses of (75 mg/kg body weight, 100 mg/kg body weight, 125 mg/kg body weight) reduces the writhes number by 91.69%, 92.33% and 96.0%, respectively. At a dose of (150 mg/kg body weight) the mice group treated with aspirin had 11 writhes. But the control group had 62 writhes, thus the positive effect of aspirin was that it reduces the writhes by 82.42%. The acetic acid induced writhing method is an effective method to evaluate peripherally active analgesics.³

Antiemetic Activity

A study was performed to evaluate the antiemetic effect of *Cleome viscosa* Linn. fixed oil on young chicks. Fixed oil in doses of (75 mg/kg body weight, 100 mg/kg body weight and 125 mg/kg body weight) reduces the retches number by 84.43%, 85.56% and 91.77%, respectively. At a dose of (150 mg/kg body weight) the chicks group treated with chlorpromazine had 47 retches. But the control group had 68 retches, thus chlorpromazine reduced the retches by 30.56%. *Cleome viscosa* Linn. seed oil inhibited emesis to a greater extent than chlorpromazine. On the basis of these results, it may be said that the fixed oil of *Cleome viscosa* Linn. has antiemetic potential and is comparable with chlorpromazine, which can relieve nausea.³

Antidiarrhoeal Activity

For evaluation of the effect of a *Cleome viscosa* Linn. methanolic extract (Family; *Capparidaceae*) for its anti-diarrheal potential against some of the models of diarrhoea in rats, "A study was performed". In castor-oil-induced diarrhoea and PGE₂ induced enteropooling in rats inhibitory activity was observed due to extract. A significant reduction in gastrointestinal motility in the charcoal meal test in rats was also shown by the extract. From the results achieved it was cleared that *Cleome viscosa* Linn is an effective anti-diarrhoeal agent.¹³

Hepatoprotective Activity

In experimental animal models, hepatoprotective activity of *Cleome viscosa* Linn. ethanolic extract against carbon tetrachloride induced hepatotoxicity was evaluated. In "in vivo" and histopathological studies, the test material was found effective. The extract effectively shortenend the "thiopental" induced sleep in animal poisoned with carbon tetrachloride. *Cleome viscosa* Linn. ethanolic extract showed similar effect as "Silymarin" a standard hepatoprotective agent. From the result observed it was cleared that *Cleome viscosa* Linn. ethanolic extract is an effective hepatoprotective agent.¹⁴

Antifibrotic Activity

The study was performed to evaluate the antifibrotic activity of *Cleome viscosa* Linn. ethanolic extract. Carbon tetrachloride was used to induce liver fibrosis in rats. By observing the level of liver hydroxyproline, thiobarbituric acid and serum enzymes the extent of liver fibrosis was assessed. Hydroxyproline, thiobarbituric acid and serum enzymes

levels were elevated and total platelet was decreased after carbon tetrachloride administration. Hydroxyproline level, thiobarbituric acid level and serum enzyme level was reduced after treatment with two different doses of *Cleome viscosa* Linn. ethanolic extract. By *Cleome viscosa* Linn. ethanolic extract liver weight was reduced that was increased after carbon tetrachloride administration that causes the deposition of collagen. From the result obtained it was clear that *Cleome viscosa* Linn. ethanolic extract is an effective antifibrotic drug.¹⁵

Antitumor Activity

A study was carried out to evaluate the anticancer effect of *Cleome viscosa* Linn. in experimental animal models. After 24 hours of tumor inoculation the extract was administered at the doses of 200 mg/kg, and 400 mg/kg body weight per day for 14 days. The mice were sacrificed after giving the final dose and 18 hours fasting. The effect of *Cleome viscosa* Linn. methanolic extract on the growth of transplantable murine tumor and life period of Ehrlich ascites carcinoma-bearing hosts was studied in current study. A significant reduction in tumor volume, packed cell volume, and viable cell count was observed due to *Cleome viscosa* Linn. methanolic extract. It also causes enhancement in the life period of Ehrlich ascites carcinoma-tumor bearing mice. In extract-treated mice the hematological profile was converted to more or less normal levels. From the results obtained it was clear that *Cleome viscosa* Linn. methanolic extract causes significant antitumor effect in Ehrlich ascites carcinoma-bearing mice.¹⁶

Anticonvulsant Activity

A study was performed to evaluate the anticonvulsant activity of *Cleome viscosa* Linn. seeds extract by Maximal Electroshock induced seizures (MES) test and Pentylentetrazole induced seizures (PTZ) test. Significant activity was shown by both ethanolic and aqueous seeds extract in MES and PTZ induced convulsions.¹⁷

Psychopharmacological Activity

For different psychopharmacological actions such as general behaviour, exploratory behaviour, muscle relaxant activity and phenobarbitone induced sleeping time and effects on normal body temperature in rats and mice, *Cleome viscosa* Linn. methanolic extract was evaluated. Reduction in spontaneous activity, decrease in exploratory behavioural pattern by the head dip and Y-maze test, reduction in the muscle relaxant by rota rod, 30 degrees inclined screen and traction tests and lowering of body temperature was observed after extract administration. Extract also causes significant enhancement in the phenobarbitone-induced sleeping time. At 200-400 mg/kg dose *Cleome viscosa* Linn. methanolic extract showed significant psychopharmacological effect.^{18,19}

Cleome viscosa Linn-Biodiesel Application

By chemical reaction of the lipids (vegetable-oil, animal fat) with an alcohol, biodiesel "vegetable-oil or animal fat based fuel" consisting of alkyl (methyl, propyl, or ethyl) esters can be obtained. Biodiesel is a clean burning alternative fuel to diesel. It is produced from domestically grown renewable resources. In variety of biodiesel alkyl esters are present but not in alkanes and aromatic hydrocarbons of petroleum derived diesel. *Cleome viscosa* Linn. seeds oil was used to prepare biodiesel. The physiochemical properties were studied for blended portion of biodiesel. The physico-chemical properties assessed includes, specific gravity, density, viscosity, flash point, fire point, cloud point, pour point, smoke point, pH, viscosity, carbon residue, saponification value, acid value, and iodine value.²⁰

Toxicity Studies

It has been reported that *Cleome viscosa* Linn. is safe during acute toxicity studies in female swiss albino mice.¹⁷

CONCLUSION

Cleome viscosa Linn. has been examined meticulously for its phytochemical and pharmacological activities. From the aforementioned explanation, it is noticeable that *Cleome viscosa* Linn. has been used as an important curative agent for various ailments, as discussed in the review. The review cited the use of *Cleome viscosa* Linn. seeds oil in the biodiesel production also. Numerous compounds were isolated from plant which are accountable for its pharmacological activities.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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