

A Review on *Cleome viscosa*: An endogenous Herb of Uttarakhand

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ABSTRACT

Herbal medicine is the oldest form of health care system known to mankind. Herbs had been used by all cultures throughout history. Herbs are the potential source of chemical constituents which have high therapeutic value. Herbal medicines are now in great demand in the developing world for primary health care not because they are inexpensive but also for better cultural acceptability, better compatibility with the human body and minimal side effects. It is estimated, that approximately one quarter of prescribed drugs contain plant extracts or active ingredients obtained from the plant substances. This review summarizes the research carried out on the plant *Cleome viscosa*. *Cleome viscosa* which belongs to family capparidaceae is an annual herb, commonly known as wild or dog mustard. In all over the world in different countries this drug is used to treat many diseases in their traditional system and it is also used for its remarkable nutritional, antioxidant and free radical scavenging properties. In India alone it is used as a traditional healer for many diseases e.g. epilepsy, irritable bowel syndrome and in protozoal and worm infections. *Cleome* is not only a weed but an important medicinal herb and this present review deals with chemical and pharmacological aspects of this medicinal herb and it provides supportive evidence about the therapeutic effects.

Keywords: Antioxidant, *Cleome viscosa*, capparidaceae, free radicals, pharmacological

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INTRODUCTION

Cleome viscosa which is also known as wild mustard, dog mustard (Jhakhya in a local language) belongs to the family capparidaceae or capparidaceae [1]. This is an annual plant which is found in all over the world and used as a medicinal plant as it has many biological activities [2]. This is the herb having yellow flowers and pods which are long and cylindrical and contains seeds. The color of seeds of the plant *Cleome viscosa* is brown to slightly black [3]. The whole plant of *Cleome viscosa* consists of a wide variety of clinical constituents which have different pharmacological actions. It is a pantropical weed occurs in woodland, grassland, wasteland and often occurs on sandy soil. This plant is found in both seasonal and humid conditions, occurs on sandy soil but sometimes on rocky and calcareous soil. This herb grows up to 1m height in India. The young shoots and leaves of *Cleome viscosa* are eaten as a cooked vegetable [1, 2]. This study summarizes the uses, chemical

constituents, pharmacological activity and some of morphological and micromorphological characteristics of *Cleome viscosa*, which is helpful to explain the role of this herb.



Figure 1: Plant of *Cleome viscosa* [4]



Figure 2: Seeds of *Cleome viscosa* [4]

Table 1: Morphological features of *Cleome viscosa* [5]

Characteristics	<i>Cleome viscosa</i>
Habit	Annual, erect herb. 50-150 cm tall.
Stem	Grooved, densely clothed with glandular hairs. Stem light green in color. The pungent smell and bitter taste.
Leaves	The palmately compound, 3 – 5 foliate. Petioles – of lower leaves 2.5 – 5cm long, Upper leaves 0.4 – 3.8cm Leaflets – sub sessile, elliptic – oblong or obovate. 2 – 4.3 cm long & 2.5 cm wide. Leaves hairy and green having bitter taste, having an unpleasant smell.
Flower	Yellow, axillary, growing, out into a lax raceme. Pedicel – 6-12 mm long – 4cm, slender, hairy. Bracts – sub sessile, foliaceous
Fruit	Slender, erect, glandular, pubescent cylindrical capsule, 2 – 3cm long stalk. 4 – 9cm x 3 – 5mm, beak 4 – 20mm long.
Seeds	1mm in diameter, reniform or subglobose, finely ridged, centrally ribbed, closed at cleft with narrow opening, glabrous. Color – reddish brown to black.

Pollen morphology of *Cleome viscosa*[6]

The pollen grains in *Cleome viscosa* are monads, bilaterally symmetrical and the aperture is trizonocolporate. The pollen

wall is reticulate and smooth. Sexine of pollen is more adjacent to pores forms annulus and these are thicker than nexine.

Table 2: Characters in the pollen grains of *Cleome viscosa*[6]

Characters	Specification
Polar diameter(μM)	36.50 \pm 2.50
Equatorial diameter (μM)	29.90 \pm 1.36
P/E ratio	1.22
Exine thickness	2.46 \pm 0.2
Exine ornamentation	Reticulate with tectum
Number of puncti	Less than 4
Number of lumina across the mesocolpium at the equator	~25
Lumina width(μM)	0.6 \pm 0.3
Muri width (μM)	0.4 \pm 0.1
Colpus length (μM)	46.10 \pm 0.1
Colpus width (μM)	0.45 \pm 0.4
Pore diameter (μM)	5.1 \pm 0.2

The values represent mean \pm standard deviation.

Micro morphological characters of *Cleome viscosa*-

Stomata present in *Cleome viscosa* are the amphistomatic type and the stomatal frequency is much higher in lower epidermis compare to the upper epidermis. The

stomatal frequency at the lower surface is 23.31 % while on upper epidermis it is 5.88%. The anticline cell walls of the plant are straight and the epidermal cells are isodiametric in shape, which are mostly triangular and pentagonal [1].

Table 3: Some micro morphological characters of *Cleome viscosa*[1]

Characteristics		Specification
Shape of epidermal cell wall	Upper epidermis	Isodiametric
	Lower epidermis	Isodiametric
Nature of anticline cell wall		Straight
Type of stomata		Diacytic
Stomatal frequency	Upper epidermis	5.88±0.98
	Lower epidermis	23.31±3.28
Trichome type (Leaf lamina)		Multicellular and glandular type
Type of calcium oxalate crystals		Aggregate and rectangular
Nature of pollen grains		Tricolpate and oval
Number of palisade parenchyma layer (leaf lamina)		1-3

Vernacular name in India-

Common name- Asian spider flower, Cleome, Jakhiya, Tickweed

Hindi- Bagra

Urdu- Hulhul

Malayalam- Naivela

Tamil- Naikkaduku

Kannada- Nayibela

Gujarati- Pilitalvani

Telugu- Kukkavaminta

Botanical Name- *Cleome viscosa* Family: Capparadaceae

Chemical constituents- The phytochemical analysis of *Cleome viscosa*L leaf extracts were tested by different precise tests. Methanol, ethanol, petroleum ether,

chloroform, acetone leaf extracts of *Cleome viscosa*L analyzed for phytochemical compounds such as tannins, saponins, flavonoids, steroids, alkaloids, phenols, terpenoids, carbohydrate, protein, fixed oil [7,8].

Flavonoids- Quercetin, kaempferol [9]. Seeds of *Cleome viscosa* were found to be a rich source of various amino acids. [10]

Seeds of *Cleome viscosa* also contain umbeliferone derivative cleosandrin, coumarino-lignans (cleomiscosins). A glycoside eriodictyol-5-rhamnoside is isolated from the whole plant of *Cleome viscosa* [11].

Table 4: Total flavanoid and phenolic contents in roots leaves and stems of *Cleome viscosa* [12]

Sample	Total flavanoid content (%w/w)		Total phenolic content (%w/w)	
	In extracts	In plants	In extracts	In plants
Root	0.194	0.012	0.136	0.007
Stem	0.206	0.013	0.397	0.024
Leaves	0.223	0.019	0.589	0.057

Table 5: Element contents of *Cleome viscosa* [13]

Metal	Percentage in seeds
Nitrogen	2.8928%
Phosphorus	0.3255%
Potassium	0.07253%
Calcium	0.3835%
Manganese	0.00643%
Iron	0.0406%
Zinc	0.00288%
Copper	0.000648%
Boron	0.01292%
Chloride	0.0335%
Sodium	0.01821%
Silicon	2.7375%
Magnesium	0.3184%

Uses of *Cleome viscosa*

In Ayurveda, it is used as an Anthelmintic [14], pruritis and several other diseases like gastro intestinal disorders and gastrointestinal infections [15, 16].

The whole herb is used in the treatment of ringworm, flatulence, colic, dyspepsia, cough, bronchitis, cardiac disorders. Leaves are used as the external application to inflammation of the middle ear [17] and applied on wounds and ulcers [18], hepatoprotective activity [19].

The leaves and seeds of the plant are used as rubefacient and to treat infection, rheumatism, fever and headache [1].

Traditionally, this plant is used in various disorders such as diarrhea [20], fever, inflammation, liver diseases [21], bronchitis, skin diseases, and malarial fever [22]. A decoction is used as an expectorant and digestive stimulant and the vapor from a steaming decoction of the whole plant is inhaled to treat headache [23]. The seeds of *Cleome viscosa* are reported to have nutritive value while the juice of leaves is applied to the skin as a counter-irritant. The root is a remedy for scurvy and rheumatism [24].

All parts of the plant are used in liver diseases, chronic painful joints [25] and mental disorders [26].

Recent research on the medicinal uses of *Cleome viscosa*

1. Effect on liver fibrosis- The extent of liver fibrosis was assessed by measuring the level of liver hydroxyproline, thiobarbituric acid, and serum enzymes

levels. Following CCl₄ administration, hydroxyproline, thiobarbituric acid levels were significantly increased and total platelet was decreased and serum enzymes levels were elevated. Treatment with two different doses of the ethanolic extract of *Cleome viscosa* Linn reduces hydroxy proline, thiobarbituric acid and also the serum enzyme levels. The liver weight that increased following CCl₄ administration due to deposition of collagen was reduced by the ethanolic extract *Cleome viscosa* Linn. Thus, the results showed that the ethanolic extract of whole plant of *Cleome viscosa* Linn found to possess Antifibrotic effect and that evidenced by the biochemical parameters [27].

2. Free radical scavenging activity of *Cleome viscosa*- The present study on the whole plant *Cleome viscosa* showed that the plant contains some bioactive principles that possess strong antioxidant activity along with strong anti-inflammatory activity, analgesic activity, and moderate CNS depressant activity. Therefore, the plant of *Cleome viscosa* could be considered as an important source of antioxidant activity [28-30].

3. Antimicrobial effect of *Cleome viscosa*- The antimicrobial activities of solvent extracts of *Cleome viscosa* and *Trigonella foenum graecum* seeds were evaluated against certain pathogenic strains of bacteria i.e. *E. coli*, *B. cereus*, *L. acidophilus* and *Pneumococcus*. Initially, the growth

inhibitory activity was examined in agar disc and later on in suspension culture followed by biochemical estimations of DNA, RNA, and protein in presence and absence of various seed extracts.

The results were also compared with one positive control of standard antimicrobial drug tetracycline a well-known antibiotic at an equivalent concentration. Based on the results it can be concluded that the plant is a potent antimicrobial agent and can successfully check the microbial infection caused by these bacterial strains in comparison to standard antimicrobial drugs [31].

4. Wound healing property of *Cleome viscosa*-

The leaves and whole plant of *Cleome viscosa* are used as a folk remedy to cure the wounds, ulcers, inflammations and skin infections. The present investigation was undertaken to evaluate the wound healing property of the leaves and whole plant of *Cleome viscosa* on the experimentally induced excision wound model in rats. The studies on the wound healing models revealed that the methanolic extract of *Cleome viscosa* possesses significant wound healing activity [32].

5. Anthelmintic activity of *Cleome viscosa*-

Alcohol and aqueous extracts from the leaves of *Cleome viscosa* showed anthelmintic activity against *Pheretima Posthuma* and *Ascaridia galli*. Three concentrations (50, 100 & 150mg/ml) of each extract were studied in activity, which involved the determination of the time of paralysis and time of the death of the worm. Both the extracts exhibited significant anthelmintic activity at the highest concentration of 150 mg/ml. Albendazole in the same concentration as that of extract was included as the standard reference and distilled water as a control. The anthelmintic activity of alcohol and aqueous extracts of *Cleome viscosa* has therefore been demonstrated for the first time [14].

6. *Cleome viscosa* in hyperalgesia, oxidative stress and lipid profile - The neuroprotective effect of ethanolic extract of *Cleome viscosa* (EECV) was investigated against streptozotocin (STZ) induced diabetic neuropathy in Wistar rats.

Intraperitoneal injection of STZ resulted in significant increase in thermal hyperalgesia and hyperlipidemia after four weeks. Antioxidant enzyme [superoxide dismutase (SOD), glutathione (GSH) and catalase) levels were reduced and malondialdehyde (MDA) level was increased significantly in diabetic rats as compared to the vehicle control rats. Four weeks of chronic treatment with *Cleome viscosa* extract attenuated the level of nociceptive threshold significantly and dose dependently. It also decreased the elevated levels of lipids, lipid peroxidation, and oxidative stress significantly and dose dependently. Many studies provide investigational evidence of the protective effect of EECV on nociception, hyperlipidemia and oxidative stress in STZ induced diabetic neuropathy [33].

7. Analgesic and antiemetic activity of *Cleome viscosa*-

Various studies showed analgesic and antiemetic activity of *Cleome viscosa*. It was evaluated that fixed oil from the seeds of *Cleome viscosa* has analgesic and antiemetic activity. The activities were assessed by using the acetic acid induced writhing test in mice (intraperitoneally) and chick emetic model (oral treatment) respectively. Analgesic activity was checked by mouse writhing test and the antiemetic activity was assessed by chick emetic model. It was concluded that *Cleome viscosa* seed oil has peripheral analgesic and antiemetic activities [16].

8. *Cleome viscosa* Increases the Expression of Basic Fibroblast Growth Factor and Type III Collagen in Rat Cutaneous Wound after topical application-

The present study explored the wound healing property of methanolic extract of *C. viscosa* using Wistar rat cutaneous excision wound model. The rate of wound contraction, quantification of hydroxyproline and histopathological examination of wound granulation tissue was performed to assess the wound healing property. From this study it was revealed that the topical application of methanolic extract of *Cleome viscosa* (2.5% w/w) significantly accelerated the wound contraction rate (95.14%, 24 postoperative days), increased the hydroxyproline content (3.947mg/100mg tissue), and improved

histopathology of wound tissue as compared to control groups [23].

9. The Antidiarrheal activity of *Cleome viscosa*- Methanolic extract of the whole plant has antidiarrheal potential against some of the experimental models of diarrhea in rats. Methanolic extract of the plant showed a significant inhibitory activity against castor oil induced diarrhea and PGE2 induced enteropooling. Gastric motility in charcoal meal test rats is also reduced after administration of the methanolic extract of *Cleome viscosa*. [15].
10. The Antipyretic potential of *Cleome viscosa* linn extract in rats- Investigation of antipyretic activity of *Cleome viscosa* was done by comparing its effect on normal body temperature and yeast induced pyrexia in albino rats. Methanolic extract of *Cleome viscosa* showed significant reduction in normal body temperature and yeast provoked elevated temperature in a dose dependent manner at different doses. [34].

CONCLUSION

In conclusion, considering all available evidence present review suggested that, *Cleome viscosa* has multiple pharmacological functions including anti-inflammatory, anticonvulsant, analgesic, antidiarrheal, antihyperglycemia, anti-hyperlipidemia and antiviral activities, among others. Therapies involved along the principles of western medicine (allopathic) are often limited in efficacy, carry the risk of adverse effects and are often too costly, especially for the developing world. In this review article, an attempt has been made to compile the reported phytochemical status and therapeutic and traditional uses of *Cleome viscosa* in India and abroad and It may be useful to the health professionals, scientists and scholars working in the field of pharmacology and therapeutics to develop evidence-based alternative medicine to cure different kinds of disease in man and animal without any toxic effects and also provide the basis for future research on the application of transitional medicinal plants. Acknowledgement- The authors are thankful to authorities of Shri Guru Ram Rai Institute of Technology and Science for providing support to the study and other facilities like

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