

A Review on Scientific Studies on Genus *Blepharis* with special reference to *B. maderaspatensis*

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ABSTRACT

Background: *Blepharis* is the genus belonging to family Acanthaceae. Various species of this Genus are widely distributed in arid and semiarid habitats. These plants have been assigned with antioxidant, anti-inflammatory, antimicrobial, anti-ulcer and wound healing properties.

Aim and objectives: This review aims to study the available scientific literature and compile the data based on the properties evaluated.

Material and Methods: Literature search from the published research articles from Pubmedcentral, Google Scholar, Science Direct, Research gate and other sources was done. The data was analysed and classified under various subheadings.

Results and Conclusion: Most studies were done to assess antioxidant properties of the various species of the genus *Blepharis*. Very few studies were conducted on anticancer activity and results of these studies are also controversial. Thus, there is a scope for further scientific exploration and validation of this genus.

Keywords: *Blepharis*, Phytochemical, antioxidant, anticancer, anti-inflammatory, Aphrodisiac

INTRODUCTION

Medicinal uses of different plants were known to humans since ancient times. Traditional Indian healthcare systems like Ayurveda and Siddha are still in practice where plant based medicines are used to cure variety of diseases. Many people prefer these medicines due to their effectiveness and minimal side effects.¹

Medicinal properties of any plant are due to presence of variety of secondary metabolites in them. All plants produce secondary metabolites like phenols, flavonoids, steroids, terpenoids, alkaloids etc. to protect themselves from adverse conditions.² Concentration and chemical structure of these compounds depend on habitat, climatic conditions and season of harvest. This, in turn, decides efficacy and potency of particular

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compound for their medicinal use.² Many phytoconstituents from natural sources like *Vinca rosea*, *Allium sativum*, *Aloe vera*, are used in allopathic formulations as analgesics, anti-inflammatory, immunomodulatory and anticancer agents.³

Blepharis is the largest genus of family *Acanthaceae*. It includes 129 species distributed among three subgenera (*Blepharis*, *Ebracteata* Vollesen and *Acanthodium*)⁴. It is an Afro-asiatic genus of family *Acanthaceae*, which is widely distributed in tropical and southern Africa, southern parts of the Middle East and central Asia, India, southern China.⁵ It grows on loose soils, along the crop fencings and prefers sandy soil with heavy percolation. *Blepharis maderaspatensis* (L.) (B. Heyne ex Roth) is also known as *Acanthus maderaspatensis* L, *Acanthus ciliaris* Burm. f., *Blepharis boerhaviifolia* Pers.⁶ It is prostrate, creeping, wiry plant and shows rooting at the nodes. It is widely distributed in arid and semiarid habitat, ranging from dry evergreen to dry deciduous forests. It is found in Africa, India, China, Srilanka and Myanmar⁷ and commonly known as *Dudhiya choti* in Hindi and *Kooravaalchedi* or *Kozhimookkan* in Tamil. Traditionally, plant ash is used for treating edema and gout; dry alcoholic extract of the plant is a potent diuretic. Leaf juice is used in eye infections, pharyngitis, and asthma. Plant is also used in treatment of ulcers, fractures, urinary tract infections and venereal diseases.⁸

Many scientific studies have been conducted on the plants belonging to genus *Blepharis* for their phytochemical analysis and medicinal properties. This review aims to survey the available literature on genus *Blepharis* and compile data related to studies on phytochemical analysis and medicinal properties.

MATERIALS AND METHODS

Literature search from the published research articles from Pubmedcentral, Google Scholar, Science Direct, Research gate and other sources was done. The data was analysed and classified under various subheadings to get clear understanding of the work done by the various authors on *Blepharis*.

PHYTOCHEMICAL CONSTITUENTS

Preliminary phytochemical analysis of *B.maderaspatensis* has revealed the presence of steroids, cardiac glycosides, flavonoids, saponins and phenolic compounds.⁹ Mohan V.R reported presence of alkaloid, catachin, flavonoid, phenol, saponin, terpenoid, tannin, sugar, glycosides and xanthoprotein in methanol extract of whole plant of *B. maderaspatensis*.¹⁰ Kiran Kumar and Sitaram separated and identified two compounds from methanolic extract of seeds of *B. glomerans* with the help of HPLC, mass spectroscopy and proton NMR techniques. They reported these compounds as Allantoin and Blepharin which are responsible for antioxidant and cytotoxic proterties.¹¹ Mohamed Abdel isolated and identified 10

compounds from ether fraction of the total extract of the wild Egyptian species *B. edulis*. Out of these, they claimed to isolate two new diacyl flavone derivatives for the first time.¹² Mohamed A. El-Shanawany isolated new isoflavone glycoside caffeic acid ester: genistein-7-O-(6-O-caffeoyl-β-D-glucopyranoside) along with seven known compounds from aerial parts of *Blepharis ciliaris* (L.).¹³ Vijayalakshmi S and kripa KG estimated levels of various metals in aerial parts (excluding flowers) of *B. maderaspatensis* by using inductively coupled plasma - optical emission spectroscopy. They found that mercury was not detectable in the extract even in traces. Cadmium, chromium, molybdenum, manganese, nickel, and lead were found at very low quantities and iron, zinc, copper, and cobalt in fairly significant concentrations. Thus, they validated that plant can be used safely in herbal preparations.¹⁴

MEDICINAL PROPERTIES

α Antioxidant and Cytotoxic

AA Baskar et al evaluated ten medicinal plants for their antioxidant and anticancer activity. They reported that *B. maderaspatensis* exhibited strong DPPH and NO scavenging abilities but was not very effective cytotoxic agent in AGS, A549, MCF-7, and COLO 320 DM cancer cell lines.¹⁵ According to Kalitha Parveen et al aqueous extract of *B. maderaspatensis* leaves demonstrated better IC 50 value for DPPH assay as opposed to ascorbic acid. It also had strong metal reducing power.¹⁶

Suriyavathana et al studied enzymatic and non-enzymatic antioxidants in leaf extracts of *B. maderaspatensis*. They found that it contains large quantities of glutathione S transferase, glutathione reductase, vitamin E and moderate amount of vitamin C.

They suggested that *Blepharis maderaspatensis* leaf extract can be good source of antioxidants.⁹ According to A. Rajsekaran, ethanolic extract of *B. maderaspatensis* possessed significant antioxidant property when tested by using DPPH assay. It also had moderate NO scavenging ability.¹⁷ Mohaddese Mahboubi et al evaluated effects of 70% methanol, 70% ethanol and aqueous extracts of aerial parts of *B. edulis*. They stated that antioxidant activity is proportional to the total phenolic contents of the extract.¹⁸ Razmi Mothana et al screened 26 plants for anticancer, antioxidant and antimicrobial activity. They demonstrated that methanolic extracts of *B. spiculifolia* (leaves and stem) do not possess significant cytotoxic property against 5637, MCF-7 and A-427 cancer cell lines. The highest concentration tested for this was 50µg/ml. Its antioxidant property also was weak.¹⁹ Wamtinga et al studied six plants belonging to family Acanthaceae.

They found that 80% aqueous acetone extract of *B. lineariifolia* stems with leaves possess moderate antioxidant properties.²⁰ Mohamed A. El-Shanawany et al evaluated efficacy of ethanolic, methanolic and

aqueous extracts of aerial parts of *Blepharis ciliaris* (L.). They proved that all these extracts exhibited high antioxidant activities as tested by DPPH assay. They concluded that this may be due to presence of phenolic compounds in these extracts.¹³

u Anti-inflammatory

Anti-inflammatory activity of ethanolic extract of whole plant of *B. maderaspatensis* was evaluated by Abimbola Sowemimoa et al. They revealed that ethanolic extract at doses of 75 mg/kg and 50 mg/kg exhibit anti-inflammatory effect in carrageenan induced paw edema and xylene induced edema in mice respectively.²¹

u Antimicrobial and antibacterial

Kalidass Subramaniam et al studied antimicrobial effect of leaf and flower extracts of *B. maderaspatensis* on Gram positive and negative strains. They found that cold acetone extract exhibited a significant control over the test pathogens whereas hot acetone extract did not show any antimicrobial effect. Similarly cold methanolic extract had significant antimicrobial activity but not the hot extract. This may be due to loss of heat labile active principle or the principle that exhibits synergistic action during the process of hot extraction.²² According to Mohaddese Mahboubi et al 70% methanol extract of aerial parts of *B. edulis* possess maximum antimicrobial activity when compared with 70% ethanolic and aqueous extracts.¹⁸

u Analgesic

Abimbola Sowemimoa et al. revealed that ethanolic extract of stem and leaves of *B. maderaspatensis* acts as effective analgesic at dose of 75 mg/kg. This was tested by mouse writhing test and Haffner's tail clip test.²¹

u Antihyperlipidemic

Chloroform, ethyl acetate and ethanol extracts of whole plant of *Blepharis maderaspatensis* were evaluated by A. Rajasekaran et al for anti-hyperlipidaemic and anti-atherogenic activities in rat models. Ethanol extract (100 mg/kg) significantly reduced the serum total cholesterol, triglycerides, LDL, VLDL, AI and CRI similar to simvastatin in acute as well as chronic models.²³

u Aphrodisiac

Vyas et al studied ethanolic, hydroethanolic and acetone extracts of *B. indica* seeds for aphrodisiac properties in male Wistar rats. They found that ethanolic extract improved testosterone levels, weight of reproductive organs and sexual behaviour parameters. This was due to higher concentration of steroidal sapogenin and alkaloid in ethanolic extract.²⁴ Similar findings were also reported by M. Mathur and Sundaramoorthy S.²⁵

u Antispasmodic

Fatima S. et.al studied effect of 80% ethanol extract of whole plant of *B. edulis*. They showed that the extract possesses antispasmodic activity against

spontaneous contractions of rabbit jejunum similar to that of standard Ca^{++} blocker verapamil. The extract also was proven to possess bronchodilator action and prevents platelet aggregation.²⁶ According to A. Rajsekaran, ethanolic extract of *B. maderaspatensis* reduced the gastric secretion with increase in pH from 2.2 to 3.15 thus, possessed good antisecretory activity. Ethanolic extract at a dose of 200 mg/kg also reduced the gastric ulcer in animal models. This activity can be attributed to the various flavonoids, and phenolics present in the extracts.¹⁷

Wound healing

Aiyalu Rajsekaran et al studied wound healing properties of chloroform, ethyl acetate and ethanolic extracts of *B. maderaspatensis* in two rat models. They found that creams prepared with 5% ethanol fraction of *B. maderaspatensis* possessed remarkable wound healing activity which was also confirmed by histopathological observation.²⁷

CONCLUSION

The literature survey shows that *Blepharis* genus plants possess medicinal values. Traditional claims are thus verified by the various scientific studies conducted. Maximum studies are done to assess antioxidant properties of the various species of the genus *Blepharis*. Very few studies were conducted on anticancer activity and results are also controversial. Thus, there is a scope for further scientific exploration and validation of this genus so that its therapeutic claims can be commercially exploited.

DECLARATION

At present authors are conducting research on aerial parts of *Blepharis maderaspatensis* to reveal its antioxidant and anticancer activity.

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