



Review Article

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FUNCTIONAL AND PHARMACOLOGICAL PROPERTIES OF BHRINGARAJA: A REVIEW

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ABSTRACT

Bhringaraja (*Eclipta alba*) of the Asteraceae family is used in various Kalpa to treat eye disease because of its Chakshushya properties. It is also used in naktyandhva and widely used in liver disease, anemia, eye disease, problem-related to hairs. It is having antibacterial, analgesic, antifungal, antiviral, antihepatotoxic, immunomodulatory, neuroprotective properties. It contains chemical compounds including coumarins, alkaloids, flavonoids etc. Because of these properties, it is used in various eye diseases. The eye is also made from the Panchamahabhutas like other body parts. Every part of the body is developed from a neural tube i.e., ectoderm and mesoderm like this every part or layer of the eyeball develop from the optic vesicle, the ectoderm and mesoderm, as the origin is the same. Also, many eye-related symptoms are seen in various systemic diseases. *Eclipta alba* can be used in various diseases which has ocular manifestation with different concentrations and in various formulation with appropriate concentration along with other herbs. So, we need to develop appropriate formulation for evidence-based medicine.

Keywords: *Eclipta alba*, Bhringaraja, Eye disease, Ayurveda

INTRODUCTION

Ayurveda is our traditional science with a holistic approach to health and personalised medicine. It is a complete medical system; it comprises physical, psychological, philosophical, ethical, and spiritual health. It helps in preventing diseases and treating them the same. The disease is developed if there is no equilibrium between Tridosha, Sapta dhatu and Tri malas. Treatment is done by using herb i.e., properties of herb viz (rasa, veerya, vipaka guna) which are opposite to the properties of dosha, dhatu, malas which are vitiated.

Bhringaraja (*Eclipta alba*) is one of the dravya brought from nature which is known for its medicinal and therapeutic properties. It is an annual herbaceous plant commonly known as a false daisy. It has been used in various parts of South America, Asia, and Africa. It is growing throughout India by marshes, rivers, and lakes in the rainy season. It is erect or prostrate, these are of the 3 types: Shweta, Pita, Krishna. The genus name come from the Greek word "Deficient" meaning absence of bristles and awns on the fruits.

It is used as a liver tonic, immune-modulatory, antihemorrhagic, analgesic, antimutagenic, anti-hyperglycaemic, antibacterial, anti-inflammatory properties, and a good rejuvenator. The main active principles of coumarins are wedelolactone, demethylwedelolactone.¹ Furanocoumarin oleanane and taraxastane glycosides.²

In Ayurveda classic, the properties of Bhringaraja are tikta, ushna, deepana, pachana, vatanulomana, rasayana, kaphavatahara, Chakshushya, twagdoshahara, keshya, varnya, Krimighna, balya.

The eyes are a very valuable organ in our body. It is like the sun in the sky nothing can be compared with vision. Doshas in the eye which are responsible for normal functioning when get vitiated leads to diseases. It is considered that Alochaka pitta in the eye is responsible for visual perception³ also it is having teja dominant mahabhuta.⁴ Due to drastic changes in lifestyle along with climatic change and pollution, these are affecting human beings and developing various diseases.

MORPHOLOGY

Botanical Description

Bhringaraja is herbaceous annual, 30 - 50 cm high, erect, or prostrate plant. It is much-branched, strigose hirsute, often rooting at the node. A common weed of moist places found throughout India ascending to 1700 m. Well-developed roots have several secondary branches arising from the main root they are cylindrical, greyish.

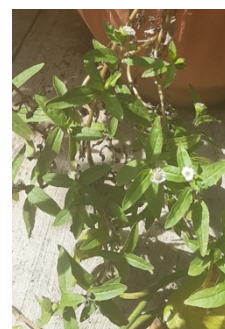


Figure 1: Bhringaraja

The stem is herbaceous, branched, occasionally rooting at nodes, cylindrical or flat, rough due to oppressed white hairs, node distinct, greenish, and occasionally brownish.

Leaves are opposite, sessile to subsessile, 2.2 - 8.5 cm long, 1.2 - 2.3 cm wide, usually oblong, lanceolate, sub-entire, sub-acute or acute with oppressed hairs on both surfaces.

Flowers are solitary or two, together on unequal axillary peduncles; involucre bracts about eight ovate, obtuse or acute, herbaceous, strigose with oppressed hairs, ray flowers ligulate, ligule small, spreading, scarcely as long as bracts, not toothed, white, disc flowers tubular, corolla often four toothed; pappus absent, except occasionally very minute teeth on the top of achene; stamen five, filaments epipetalous, free, anthers united into a tube with base obtuse; pistil bicarpellary; ovary inferior,

unilocular with one basal ovule.⁵

Taxonomic hierarchy of *Eclipta alba*

Kingdom - Plantae
Subkingdom - Viridaplantae
Infrakingdom - Streptophyta
Division - Tracheophyta
Subdivision - Spermatophytina
Infra division - Angiospermae
Class – Magnoliopsida
Superorder - Asteranae
Order - Asterales
Family - Asteraceae
Genus - *Eclipta* L.
Species - *Eclipta alba* (L.) Hassk

Table 1: Phytoconstituents of *Eclipta alba*⁶⁻⁹

Nature of phytoconstituents	Phytoconstituents
Coumestan	Wedelolactone, demethylwedelolactone, demethylwedelolactone-7-glucoside
Terpenoids and their glycosides	Eclalbasaponins VII–X (taraxastane triterpene glycosides), eclalbasaponins I–VI (oleanane triterpene glycosides), eclalbasaponins I–VI (triterpene glycosides), ecliptasaponins C and D (triterpenoid glycosides), α -amyrin, oleanolic acid, ursolic acid (triterpenoids)
Sterol	Stigmasterol, daucosterol, stigmasterol-3-O-glucoside
Alkaloids	-[(20S) (25S)-22,26-imino-cholesta-5,22(N)-dien-3 β -ol] (verazine), [20-epi-3-dehydroxy-3-oxo-5,6-dihydro-4,5-dehydroverazine], [(20R)-20-pyridyl-cholesta-5-ene-3 β ,23-diol] (ecliptalbine), [(20R)-4 β -hydroxyverazine], [4 β -hydroxyverazine], [(20R)-25 β -hydroxyverazine], [25 β -hydroxyverazine]
Flavonoids	- Luteolin-7-glucoside, luteolin, apigenin, orobol (isoluteolin)
Sesquiterpene lactones	5-hydroxymethyl-(2,2':5',2'')-terthienyl tiglate, 5-hydroxymethyl-(2,2':5',2'')-terthienyl agelate, 5-hydroxymethyl-(2,2':5',2'')-terthienyl acetate
Terthienyl aldehyde	Ecliptal
Fatty alcohols	Henriacontanol, heptacosanol
Volatile oils	- Heptadecane, 6,10,14-trimethyl-2-pentadecanone, n-10-hexadecanoic acid, pentadecane, eudesma-4(14),11-diene, phytol, octadec-9-enoic acid, 1,2-benzenedicarboxylic acid diisooctyl ester, (Z, Z)-9,12-octadecadienoic acid, (Z)-7,11-dimethyl-3-methylene-1,6,10-dodecatriene, (Z, Z, Z)-1,5,9,9-tetramethyl-1,4,7-cycloundecatriene
Saponins	Eclalbatin (triterpene saponin), dasyscyphin C
Polyacetylinic compounds	α -Terthienylmethanol, polyacetylenes, polyacetylene substituted thiophenes
Phenolic acids	Protocatechuic acid, 4-hydroxy benzoic acid

Table 2: Properties of *Bhringaraja (Eclipta alba)*

Keshya (promotes hair growth)	Varnya (improves skin complexion)	Chakshushya (increase eyesight)
Hepatic stimulant	Digestive stimulant	Appetizer
Cholagogue (promotes the discharge of bile)	Detoxifying	Neuroprotective
Analgesic	Antihypertensive	Anti-ischemic
Hematogenic	Carminative	Anthelmintic

Table 3: Pharmacological activities of chemical constituents¹⁰

Chemical constituents	Pharmacological activities	Plant part
Wedelolactone	Antihepatotoxic, Trypsin inhibitor Antibacterial, Antivenom.	Leaves.
Eclalbasaponine	Hair revitalizing, Antigardial, Antiproliferative	Whole plant
Demethylwedelolactone	Antihepatotoxic, Dye, Antihemorrhage, Antivenom,	Leaves
Dasyscyphin C	Antiviral, Anticancer	Stem
Eclalbatin	Antioxidant	Root plant
Ecliptalbine, Verazine	Lipid-lowering	Stem

Vernacular Names

- Botanical name - *Eclipta alba*
- Common name - False Daisy
- Hindi - Bhringaraja, Bhangra, Mochkand, Babri
- Bengali – Kesuriya
- Gujarati – Bhangaro
- Kannada - Garagadasoppu, Garugalu, Kadiggagaraga
- Malayalam - Kannunni, Kaikeshi
- Marathi - Bhringuraja, Maka
- Sanskrit - Kehraj, Bhringaraja, Bhangra

- Tamil - Karisalaankanni, Garuga, Kayanthakara
- Telugu – Galagara
- Urdu - Babri, Bhangr

Antibacterial Activity

The chemical wedelolactone which is present in *Bhringaraja* is having antibacterial properties and has proven effective. *S. epidermidis*, *S. typhimurium*, *Staphylococcus aureus*, *P. aeruginosa*, *S. flexneri*, *E. coli*.¹¹ Infection of these microbes develop diseases in the coat of eyeball viz conjunctiva, cornea, uveal tract, sclera, dacryocystitis, blepharitis.

Antiviral Activity

Eclipta alba extract having strong antiviral activity.¹² So, it can be used in viral eye disease. Like viral keratitis or other viral diseases.

Antifungal activity

Crude saponins extract of *Eclipta alba* has good antifungal properties and is effective against *F. solani*, *A. flavus*, *A. niger*. Also, Alkaloids crude extracts having antifungal, effective against *F. solani*, *A. flavus*. Flavonoids crude extract from *alba* effective against *F. solani*, *A. flavus*.¹³

In aspergillums fumigates keratitis

Wedelolactone reduces host immune responses. It is attenuating neutrophil recruitment and IC – IB maturation as aspergillus fumigates keratitis and decreases MPO level (Myeloperoxidase). Pre-treatment with wedelolactone inhibits caspase -1 activity so it decreases pro-inflammation cytokine interleukin 1beta (IL-1B) Maturation. Wedelolactone combined with an antifungal medicine could be a potential therapy for reducing lesion severity in fungal keratitis.¹⁴

Effect of *Eclipta alba* on memory and learning

Cholinergic dysfunction and suppression of the immune system have been implicated in inducing cognitive deficits in the neuronal memory circuits. *Eclipta alba* produces a significant reduction in the transfer latency. When tested after an interval of 24 hours in the EPM.

It indicates that it improves the ability to retrieve information and therefore it strengthens explicit memory. In special habitual learning, the exploratory rearing is significantly reduced with time indicating improved memory. Luteolins possessing credible enhancement of the central cholinergic receptors.

Luteolins being an active constituent in the extract of *Eclipta alba*. It may be responsible for minimizing cognitive deficits due to cholinergic dysfunction. Their profound free radical scavenging action could insulate neuronal tissues from degeneration. Due to the immune-modulatory action of *Eclipta alba*, it preserves these areas from stress perturbation. Therefore, *Eclipta alba* can serve as a potential memory modulatory.¹⁵

Alochaka Pitta, which is one of the types of Pittas, situated in Chakshu, has 2 types Chakshuvaisheshik and Buddhivaisheshik.¹⁶ They work for the formation and storage of the image. Chakshuvaisheshik means through coats of eyeball the ray from any object falls on the retina which is visualised and Buddhivaisheshik is the formation of an image of an object through the nervous route. Any deformity in these routes can cause diseases. So, the Chakshushya karma of Bhringaraja may work in this way by keeping the Alochaka pitta and its type in the equilibrium state.

Antihepatotoxic properties

Eclipta alba root extract is a powerful liver tonic. It possesses a wide range of biological activities and is used for the treatment of hepatitis and cirrhosis.¹⁷ The plant contains an alkaloid, ecliptine. It has choleric action and lipid peroxidation the extract augmented bile flow in rats. It suggests stimulation of liver secretory capacity.¹⁸

Eclipta alba has a protective role against liver diseases such as liver cirrhosis and infective hepatitis. The components of *Eclipta alba* extract wedelolactone demethylwedelolactone, mononuclear infiltration necrotic foci stimulate the regeneration of hepatocytes in the liver.¹⁹

Liver disorder in which symptoms related to eyes are seen are as follows²⁰

• Xanthelasma

They are associated with hyperproteinaemia's cholestasis and primary biliary cholangitis.

• Conjunctival icterus

Seen when plasma bilirubin levels rise above the normal level.

• Keratoconjunctivitis sicca / Dry eye

It can be caused by primary biliary cholangitis and chronic hepatitis C virus infection. Prolonged dry eye can result in a multitude of symptoms including grittiness or foreign body sensation, blurred vision, redness epithelial erosion and infection.

• Kayser – Fleischer Rings

They are thought to be pathognomonic for Wilson's disease and should be considered secondary to Wilson's disease. This ring rarely can be seen also in primary biliary cirrhosis and primary sclerosing cholangitis. Kayser – Fleischer rings are due to copper deposition in the Descemet membrane. They are seen in the peripheral cornea. It first occurs superiorly and gradually spread circumferentially and inferiorly.

• Sunflower cataract

It is secondary to copper deposition in the eye. It is an ocular manifestation of Wilson's disease. Copper deposits on the anterior and posterior lens capsule. Also, other several liver diseases can cause lens opacities – includes galactosemia, Zellweger hepato-Cerebro-renal syndrome, adrenoleukodystrophy, neonatal haemolytic jaundice syndrome.

• Post. Embryotoxon

Alagille syndrome is an autosomal dominant cholestatic liver disease associated with multiple ocular abnormalities including keratoconus, refractive error, band keratopathy, chorioretinal changes and anomalous optic disc. Post embryotoxic is a corneal finding and represents a thickened and anterior displaced termination of the Descemet membrane.

• Cranial nerve Abnormalities

Liver disease can cause cranial nerve abnormalities that present as gaze palsy or nystagmus. These are various signs seen in the eye due to the pathology which occurs in the liver. To reduce these signs, we must break the pathology occurring in the liver. Because of good liver tonic action, Bhringaraja can be used.

• Analgesic

Eclipta alba has antinociceptive activity, which is used in pain-relieving treatment²¹. As Bhringaraja has Roojahara properties.

• Antioxidant

Eclipta alba contains alkaloids, phenolic, Compounds, flavonoids, tannins, ascorbic acid content i.e., their constituent having antioxidant activities.²²⁻²⁵

• Neuroprotective function

Curcumin, luteolin and DHA have beneficial effects on supplemented mouse retina and brain. The mixed populations of microglia seen in the retina suggest that these supplements can to some extent attenuate microglia activation coinciding with a more functional retina. Furthermore, these anti-inflammatory substances could have further beneficial effects when paired with different therapies. So, it can be used in optic neuropathies as it works as nerve protection on the retina.²⁶

• **Hair growth activity**

Eclipta alba is a well-known Ayurvedic herb for hair growth. Bhringaraja in hair oil preparation promotes hair growth and maintains hair black.¹²

Formulations

Bhringaraja taila, Haridradyavarti, Netrashanirasa, Bhringarajadi churna, Krumikuthar rasa, Bhringaraja churna, Bhringaraja ghrita, Bhringarajasav, Mahabhringaraja taila, Narsingha rasayana, Neelibhringyadi taila, Shadbindu taila, Sutshekhar rasa.

CONCLUSION

Eclipta alba is a medicinal plant having significant properties for the treatment of various diseases. It has various chemical constituents which are useful in treating diseases. It inhibits the growth of bacteria, fungus, viruses also inhibit the growth of cancerous cells. It is used in memory enhancing. It is used as an antioxidant and having antihepatotoxic activities. By using these properties of Bhringaraja, we can treat the disease of the eyes. Also using these principles, we must do further studies on various eye diseases. It is a need to find out various and proper drug of choice to treat eye disease with appropriate concentration.

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