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A Phytopharmacological Review of Prospective of *Bhrungaraj* (*Eclipta alba Hassk.*)

Review Article

Sanjivani Shekokar[1*], Shraddha U Nayak [2]

1. Associate Professor, Dravyaguna Department. Government Ayurved College, Nanded
2. Professor, B.M. Kankanawady College of Ayurved, KLE University, Belgaum

Abstract

*Eclipta alba Hassk.(*compositeae*)* is an important small branched annual herbaceous plant in Ayurveda described first by *Bhavprakasha* and is widely used for treating various ailments in the Indian system of medicine. Aim: Aim of this review is to provide comprehensive information on the pharmacological activities of various part of *Eclipta alba Hassk*. Setting and design: This is a contribution which provides a comprehensive review on ethnomedicinal uses, chemical composition, and the pharmacological profile of *Eclipta alba Hassk*. as an important medicinal plant. Material and methods: All the relevant universally accepted electronic databases were searched with respect to the terms "Bhrungaraj", "False Daisy", "*Eclipta erecta,*", "*Eclipta prostate,*", "*Verbesina alba,* "& *Verbesina prostrate*" including Indian classical texts, pharmacopoeias, Ayurvedic books, journals, etc., for information without specific timeline. Complete information of the plant has been collected manually. Result and conclusion: The collected data reflects that many ethno-medicinal claims have been confirmed through the modern in-vitro and in vivo pharmacological studies using different extracts and their isolates of *Eclipta alba Hassk*. The isolation of active constituents, their biological actions, clinical safety and validation of traditional uses of *Eclipta alba* could provide leads for further scientific research. The information collected here will be useful to set up research protocols for modern drugs and Ayurvedic formulation development.

Keywords: *Bhrungaraj*, *Eclipta alba*, *Eclipta erecta*, *Eclipta prostate, Hepatoprotective*

Introduction

Bhrungaraj is well known drug for hair disorders from the very ancient time. It is described by *Bhavaprakash*, *Raj Nighantu*, *Bheshajjya ratnavali* and many ayurvedic texts. It is known by its synonyms like *Kesharaj*, *Kesharanjana*(1), *Markava* , etc.

The genus name comes from the Greek word meaning "Deficient," with reference to the absence of the bristles and awns on the fruits. The specific *Eclipta alba* means white which refers to the color of the flowers(2).

The herb is being used for its curative properties as antimytotoxic, analgesic, antibacterial, antihepatotoxic, antihaemorrhagic, antihyperglycemic, antioxidant, and for immunomodulatory properties and it is considered as a good rejuvenator. It is an active ingredient of many herbal formulations used for liver disorders and enhances liver cell generation .It is used for its tonic and diuretic action in hepatic and spleen (3) enlargement.

It is also useful in *Krumi* (worm infestation), *Shotha*(oedema), *Pandu*(anemia)(4), etc. also useful for wound healing and skin diseases. Several formulations are prepared from this drug like *Bhrungaraj Tail*, *Bhrungaraj Swaras*, etc which are popularly used for hair treatment in hair disorders also (5). Still there is a large market trade of oils & medicaments prepared from *Bhrungaraj*. Various chemical constituents (6) are separated from *Bhrungaraj* & are being clinically tested for various hepatic disorders, etc.

*Corresponding Author:
Sanjivani Shekokar
Associate Professor,
Dravyaguna Department,
Government Ayurved College, Nanded.
Email id: - drsanjivanisshekokar@rediffmail.com

Botanical description (7)

Eclipta alba (L.) Hassk. (Syn. *Eclipta prostrata* L.) is commonly known as False Daisy, yerba de tago, and bhringraj, a plant belonging to the family Asteraceae. Root is well developed, cylindrical, greyish in color. It is also named 'kehraj' in Assamese and karisalankanni in Tamil. Floral heads are 6-8 mm in diameter, solitary, white, achene compressed and narrowly winged.

Eclipta alba is a herbaceous tufted plant that may be prostrate or grow up to 50cm in erect form. The stems and leaves are covered with white hairs. Sometimes the stems may be reddish. The leaves are simple, opposite and attached to the stem without petiole. The inflorescences are white on a hemispherical heads of 1cm in diameter. The figures of Eclipta entire plant and its different parts are shown in Figure 1-4.

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Fig. 1 Entire Plant

Fig. 2 Entire Plant

Fig. 3 Inflorescence

Fig.4 Roots of Eclipta alba

Botanical classification (8):-

- Kingdom – Plantae
- Unranked – Angiosperms
- Unranked – Eudicots
- Unranked – Asterids
- Order – Asterales
- Family – Asteraceae
- Genus – Eclipta
- Species – Eclipta alba
- Botanical name - *Eclipta alba L. Hassk*
- Synonyms – *Eclipta erecta, Eclipta prostate, Verbesina alba, Verbesina prostrate*

Vernacular names or Synonyms:-

- Sanskrit – Bhrungaraj, Kesharaj, Markava, Kesharanjana, Kesharaj, etc.
- Hindi – Bhangara, Bhangarayya
- Punjabi – Bhangara, dodhak, Babri.
- Marathi – Maka
- Gujarat –Bhangaro.
- Bengali – Kesuriya, Kesuti.
- Tamil – Kaikeshi.
- Telgu – Galagara, Gunta, Galijaeru.
- Arabic – Kadim-ul-bint, Radim-el-bint.
- Malyalam – Cajenneam,Kanni.
- Konkani - Mako, Kajalamavu.

Gunadharma –

The properties of *Bhrungaraj* are well illustrated in *Bhava Prakash nighantu*, *Guduchyadivarga* /240-241.

Guna Ruksha laghu, *Rasa Katu Tikta*, *Vipak Katu & Virya Ushna*

Doshakarma – Kapha Vata shamak.

Species

It is of three varieties – Yellow (flowered), white (flowered) & black (fruiting) (9)

The Yellow is *Wedelia calendulaceae*, this herb has yellow flowers. The black variety is a variety of the white one, called *Kala Bhrungaraj*, Black & white-*Eclipta alba*.

Parts used

Herb roots & leaves, *Panchanga*, *beeja* all parts are used.

Cultivation & propagation

Vegetative propagation by using buds of length of 5cm.It can be planted in well prepared beds as above seed beds or nursery bags. The plants will be ready for transplanting within 30 to 45 days.

Harvesting

The whole plant is plucked after 9 to 10 month. The fresh plants are chopped & dried in shade. The seeds are collected when it turns black in color. The average matured plants give 2500 Kg. per acre of dry materials.

Distribution of Eclipta sp. Worldwide (10)

It is usually found on poorly drained, wet areas; along streams and ditches in marshes and on the dikes of rice paddies. However, it is also common in lawns and in upland conditions where rainfall is about 1200mm or more.

It can grow under wet, saline conditions but is often a weed of drier sites in plantation crops. *E. alba* is a native of Asia, but has a general distribution over the world. It is on all continents in tropical, subtropical and warm temperate regions.

Habitat

Sub herbaceous annual or perennial tufted plant described as a prostrate or grows up to 50cm in erect form. In reality, it develops at the base of the main stem, several long stems, prostrate, rooting at the nodes. It grows commonly in moist places as a weed all over the world. It is widely distributed throughout India, China, Thailand, and Brazil.

Phytoconstituents

Eclipta alba (L) has wide variety of active constituents as described in **Table no 1**,

The constituents are coumestan derivatives like wedololactone[1.6%], and alkaloidal principles like ecliptine, glyoide like demethylwedelolactone, desmethyl-wedelolactone-7 glucoside present in leaves and other constituents are ecliptal(11), ß-amyrin, luteolin-7-O-glucoside in aerial parts, hentriacontanol, heptacosano in roots, stigmasterol. All the parts of *Eclipta alba* and chemical constituents are used as anticancer, antileprotic, analgesic, antioxidant, antimyotoxic, antihaemorrhagic, antihepatotoxic, antiviral, antibacterial, spasmogenic, hypotensive, ovicidal, promoter for blackening and growth of hair (12).

Table 1: Chemical constituents and biological activities of parts of *Eclipta alba*

Sr no.	Part	Formulation	Constituents	Biological Activity
1.	Leaves	Juice	Stigmasterol,a-terthienymethanol, Wedelolactone[1.6%], Desmethylwedelolactone, Desmethyl-wedelolactone-7-glucoside	Skin diseases, allergic Urticaria, Asthma, Inflatulence, Colic and liver affections, Bronchitis, Enlarged glands, Dizziness, Vertigo, Blurred vision
2.	Roots	Powder/ juice	Hentriacontanol, Heptacosanol& Stigmasterol4, Ecliptal12-1	Liver tonic, Emetic, Purgative, Antiseptic to ulcers, Wounds in cattle
3.	Aerial parts	Juice	ß-amyrin & Luteolin-7-0-glucoside, Apigenin, Cinnaroside, Sulphur compounds	
4.	Stems	Paste	Wedelolactone	
5.	Seeds		Sterols	Sexual debility, Tonic, Aphrodisiac
6.	Twigs of the plant	Paste	Unnamed alkaloid	
7.	Whole plant	Paste	Large amounts of resin, Ecliptine, Reducing sugar, Nicotine, Stigmastero, Triterpene saponin, Eclalbatin togetherwith a -amyrin, Ursolic acid, Oleanolic acid.	Rejuvenating, Age-sustaining tonic, Detoxifying, Deobstruent, Antiseptic herb in vitiated blood, Anaemia, Splenic and liver enlargements, Catarrhal jaundice, Hyperacidity, Gastritis, Dysentery, Anticatarrhal, Spasmogenic, Hypotensive properties

In *Auyrveda* medicine, the leaf extract is considered as a powerful liver tonic, rejuvenator, and hair growth promoter and used for dyeing hair and tattooing. *Eclipta alba* also has traditional external uses in athlete foot, eczema and dermatitis, on the scalp to address hair loss and the leaves have been used in the treatment of scorpion stings. It is widely used as anti-venom agent against snakebite in China and Brazil (13) (Mors, 1991).

Wedelolactone is a large amount of resin & an alkaloidal principle ecliptine(14) is obtained. Wedelolactone is found in yellow & white variety.

Uses

Shotha, *Vrana*, *Savarnikarana*, *Kesha Vyadhis*, *Shleepada*, *granthi*, *Shirashula*, Greying of hair, etc.

It is also used as application in Hepatic & Splenic enlargements & in various chronic skin diseases. It is also useful internally in *Yakrut vyadhis*, *Yakrut vruddhi*, Spleenic enlargements, jaundice, *Udarashula*, etc. In *Krumi* with Castor oil, *Shwasa*, *Kasa* & in *Mutradaha*.

Useful in Serpent bite, scorpion bite, chronic glandular swellings & other skin diseases & Alopecia, etc. Leaf juice is used as hepatic tonic.

Pharmacological activities of *Bhrungaraj*

The crude extract shows wound healing property and it counteracts CCl4-induced inhibition of the hepatic microsomal drug metabolizing enzymes. The restoration of loss of hepatic lysosomal acid phosphatase and alkaline phosphatase by CCl4 was significantly seen by using *Eclipta alba* showing the hepatoprotective activity of *Eclipta alba* which is by regulating the levels of hepatic microsomal drug metabolizing enzymes (16). The fresh plant is used as a helpful medication by AIDS patients in part showed potential as a therapeutic agent against Giardia intestinalis infections also (17, 18). It shows antimicrobial and antioxidant properties (19) and is being used in pilex formulation along with other ingredients reported to decrease the bleeding time of the patient (20). Leaf extract is being used in oedema. It is used in the treatment of paronychia (21).

Hepatoprotective activity

The study of hepatoprotective effect of the ethanol/water (1:1) extract of whole plant of *Eclipta alba* has been conducted at subcellular levels in rats against CCl4-induced hepatotoxicity which showed that *Eclipta alba* significantly counteracted CCl4-induced inhibition of the hepatic microsomal drug metabolizing enzymes. The restoration of loss of hepatic lysosomal acid phosphatase and alkaline phosphatase by CCl4 was observed. This study elaborated shows that hepatoprotective activity of *Eclipta alba* is mainly based on regulation of the levels of hepatic microsomal drug metabolizing enzymes [(16)]. Bi-herbal ethanolic extract (BHEE) of combination of leaves of *Eclipta alba* and seeds of *Piper longum* was administered orally at a dose level of 50 mg/kg body weight once for 14 days which was found to restore the elevated serum marker enzymes such as SGOT, SGPT, ALP, LDH, ACP, GGT and 5' Nucleotidase, due to CCl4 treatment. It was observed that the biochemical parameters like total protein, total bilirubin, total cholesterol, triglycerides, and urea were also restored towards normal levels (22).

The study of hepatoprotective activity of methanolic extract of leaves and the chloroform extract of roots of *Eclipta alba* was carried out using carbon tetrachloride for inducing liver damage and assessment of Lysosomal enzymes level in wistar albino rats. The methanolic extract of leaves and the chloroform extract of roots of *Eclipta alba* showed very significant activation and respectively causing 72.8% & 47.96% reduction in the lysosomal enzyme. It was observed that the triterpenoid eclabasaponin fraction from methanolic extract of leaves produced significant increase (78.78%) and the alkaloidal fraction (60.65%) reduction of carbon tetra chloride induced increase in lysosomal enzyme in the blood. The chloroform extract of roots having the coumestan fraction and triterpenoidal saponin fraction from produced very significant (75.6%) and (52.41%) respectively reduction of carbon tetra chloride induced increase in lysosomal enzyme levels in blood (23).

Antihyperlipidemic activity

The aqueous leaf extract of the *Eclipta. prostrata* was given orally to the rats and it has been observed that in the atherogenic diet induced hyperlipedemic model, significant reduction in total cholesterol, triglycerides, total protein was seen along with a significant elevation in the high density lipoprotein cholesterol levels. The dose of about 200mg/kg of the extract showed better results as compared to 100mg/kg (24). In another study the animal model containing Charles River Sprague-Dawley CD rats (specific pathogen-free/viral antibody-free Crj/Bgi male, 180 ± 10 g) were fed the experimental diets which were supplemented with 0 mg (control), 25 mg (E25), 50 mg (E50), or 100 mg (E100) of a freeze-dried butanol extracted fraction of E. prostrata per kilogram of diet for 6 weeks and control group which was untreated. The results were reported as significant reduction of serum triacylglycerol and total cholesterol, low-density lipoprotein-cholesterol levels and elevation in the high-density lipoprotein in the E50 and E100 groups respectively as compared with the untreated control group (25).

The butanol extract fraction of *Eclipta prostrata* (Linn) was found to reduce serum lipid levels effectively and improve antioxidant activities in CD rats.

Antioxidant action

In this study Charles River Sprague-Dawley CD rats were orally fed with50mg/kg and 100mg/kg dose alcoholic extract of *Eclipta prostrata* and the study revealed that the extract reduced serum hydroxyl radical (nmol/mg protein per minute) and serum lipid peroxide (nmol/mg protein) levels to some level as compared to untreated group. The 100mg/kg dose of the extract of Eclipta significantly reduced Carbonyl content of oxidatively modified proteins (26).

Antioxidant activity of *Eclipta prostrata* was determined by parameters such as- FRAP radical scavenging activity, reducing activity, and DPPH assay. It was observed that the antioxidant capacity was increased as the concentration of the extracts was increased from 25 to 100mg/ml against α-tocopherol as reference drug . The antioxidant activity of the hexane, ethyl acetate, ethanol and water extracts of *E. prostrata* were also determined by ferric thiocynate (FTC) method used to determine the amount of peroxide formed and that react with ferrous chloride (FeCl2) to form a reddish ferric chloride (FeCl3) pigment. In this method, the concentration of peroxide decreases as the antioxidant activity increases so Hexane, ethyl acetate, ethanol and water extract of Eclipta showed antioxidant activities at various concentration (50, 100, 250 and 500 in µg/mL) in the increasing order of the concentration. Ethanolic extract at the concentration of 500 µg/mL showed maximum i.e. 77.62% which is close to the reference compound used α-tocopherol (80.06%) (19).

Action on immune system

Immunomodulatory action of *Eclipta alba* was observed by the protection of neuronal tissues. So, *Eclipta alba* proves to be a potential memory modulator (27).

Methanol extracts of whole plant of *E. alba* (1.6% wedelolactone) was used to assess then immunomodulatory activity at five dose levels (dose-response relationship) ranging from 100 to 500 mg/kg by

using carbon clearance, antibody titer and cyclophosphamide immunosuppression parameters the study showed significant increase in phagocytic index and antibody titre and the F ratios of the phagocytic index and WBC count were observed to be also significant (28).

In another experiment the aqueous leaf extract *Eclipta alba* was fed to a fish (tilapia, Oreochromis mossambicus) at 0, 0.01, 0.1 or 1% levels as a diet for about 3 weeks and after each week, non-specific humoral (lysozyme, antiprotease and complement) and cellular (myeloperoxidase content, production of reactive oxygen and nitrogen species) responses and disease resistance were noted against Aeromonas hydrophila which showed increased activity of non-specific immune parameters. Thus the study results indicated that dietary intake of E. alba aqueous leaf extract can enhance the non-specific immune responses and disease resistance of O. mossambicus against A. Hydrophila(29).

Anti-inflammatory and analgesic effect

Anti-inflammatory activity was studied in Albino wistar carrageenin and egg white induced hind paw edema rats by using methanolic extract of *Eclipta* after oral administration. The dose of100 and 200 mg/kg showed significant activity in carrageenin and egg white induced hind paw edema in rats which was compared with indomethacin (10 mg/kg) and cyproheptadine (8 mg/kg) which were used as control (30). The study of analgesic effect on albino mice was conducted using ethanolic and alkaloidal extract of *Eclipta alba.* The Standard experimental models such as the tail clip method, the tail flick method and the acetic acid induced writhing response all were used which showed that both the ethanol extract as well as the total alkaloids produced good analgesic activity in the different models of rats. The alkaloidal extract fraction was found to be the most efficacious in all models used for testing (31, 32).

Antidiabetic effect

The antidiabetic action was studied in alloxan induced diabetic rats using the leaf suspension of *Eclipta alba* (2 & 4g/kg) orally. It was observed that there was significant reduction in blood glucose level and glycosylated hemoglobin A well as decreased activity of glucose-6 phosphatase and fructose1, 6-bisphosphatase and increase in the activity of liver hexokinase. The study revealed potent antihypergylcemic activity of oral administration of *Eclipta alba* suspension possess in the alloxan induced diabetic rats (33). *Eclipta alba* has been used as an ingredient in polyherbal formulation like Pan-five which were scientifically and clinically proved to possess Antidiabetic and diuretic activity by acting upon pancreas through the mode of restoration and regeneration of pancreatic β-cell activity (34).

Effect on hair growth

Eclipta alba is known for it hair growth promoting action hence used in hair oil preparations and also to maintains the black hair (35). Alopecia is a dermatological disorder with its psychosocial implications on patients having hair loss The study was conducted on shaved denuded skin of albino rats using Petroleum ether & ethanolic extracts in 10%w/v quantity which was incorporated into oleaginous cream (water in oil cream base) which was applied topically in one group and Minoxidil 2% solution was applied topically and served as positive control for comparison (36) The duration required for hair growth initiation as well as completion of hair growth cycle was recorded.. The result of treatment with petroleum ether extracts were better than the positive control minoxidil 2% treatment(36).

Anticancer Activity

The study of anticancer activity was carried out in Swiss albino mice using methanol extract of *Eclipta alba* against Ehrlich Ascites Carcinoma (EAC). . The methanolic extract of *Eclipta alba* was administered orally in the wistar albino mice at a dose of 250 and 500 mg/kg body weight for 9 consecutive days. The parameters like tumor volume, tumor cell count, viable tumor cell count, nonviable tumor cell count, mean survival time and increase in life span in experimental animal models were applied for assessment of cancer. The study proved that the methanolic extract of *Eclipta* showed significant results in the parameter like increased the life span of EAC treated mice and also maintained the restoration of the hematological parameters as compared to the EAC bearing mice. This proved the anticancer activity of the methanolic extract of *Eclipta alba* in the tested animal models Coumestans which are active constituents of Eclipta are commonly known for its action as phytoestrogens which act as chemopreventive agent in breast and prostate cancer (37) The another compound in *Eclipta protrata* is Dasyscyphin-C (saponins) which is a newer isolated compound also reported to have anticancer-cytotoxic activity in an invitro study on study (38) in HeLa (Human cervical carcinoma) & vero cell lines , it showed a good anticancer-cytotoxic activity on HeLa cells. The hepatic stellate cell line (HSCs) of rat was used as in-vitro assay system in this study where the methanolic extract of aerial parts of Eclipta prostrata was used. The study revealed significant inhibitory activity on HSCs proliferation (39).

Antibacterial activity

The antibacterial activity study was conducted using the aerial parts of *Eclipta alba* which were extracted in various solvents like acetone, ethanol, methanol, water and hexane against selected strains of gram positive and gram negative bacterial species by agar well diffusion methods. The MIC and MBC methods were also applied (40) for the study.

The *Eclipta alba* extract in the solvent Hexane showed high antibacterial activity against the following bacteria - *S.aureus, B.cereus, E.coli, S.typhi, K.pneumoniae, S.pyogenes* and *P.aeruginosa as compared to the inhibitory activity of* standard antibiotics (Ciprofloxacin 25 µg/ml).

The other extract of *Eclipta alba* like acetone, ethanol, methanol and aqueous extracts showed intermediate activity against *S.aureus, B.cereus, E.coli,*

S.typhi, K.pneumoniae, P.aeruginosa, P.mirabilis and S.pyogenes in comparison with standard antibiotics (Ciprofloxacin 25 µg/ml) *The study* showed maximum MIC (Mean inhibitory concentration) of 90.0µg/ml shown by *E.coli* and *S.aureus* (below 100µg/ml),and the MIC of 125.0µg/ml shown by *E.coli*, *K.pneumoni, P.mirabilis* and *S.typhi proved* better (100-500µg/ml) as such by the action of acetone, ethanol, methanol and hexane extracts on test bacterial species respectively.

MIC between (500-1000µg/ml) was considered to be good.

MBC results were having similar results to MIC and confirmation was made by observing the absence of growth of bacteria in the culture plates after 24 hrs of incubation at 37ºC.

Thus the Eclipta proved to be a potent antibacterial plant drug.

This antibacterial and hepatoprotective action of *Eclipta alba* extract can be utilized to formulate a potent dry to combat the bacterial and hepatotoxic infections.

Memory enhancing activity (41)

The extract of 100 and 200 mg/kg extract of *Eclipta alba* was administered in rat to evaluate transfer latency (TL) on an elevated plus maize which was considered as a measure of acquisition and learning to assess spatial habitual learning from 20 min. to 144 hour. The results revealed significant improvement in retrieval of memory.

Other pharmacological actions of *Eclipta alba*

The methanolic extract *Eclipta prostrata* contains free carboxylic acid at C-28 position in echinocystic acid derivatives which showed antifibrotic activity in a study conducted to study the antiproliferative activity of triterpenoid from hepatic stellate cells in rats (42).

In an another study Ethanolic and ethyl acetate fractions of Eclipta prostrata were tested for antibacterial activities against *Escherichia coli*, *Klebsiella pneumoniae*, *Shigella dysentrae*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Staphylococcus aureus* and were found to be potent antibacterial (43)

Ethanopharmacological review showed that *Eclipta prostrata* is being used combined with a non-plant material which is used to bath children suffering from malnutrition for 9 days and used as self medication by AIDS patients in various parts of southern Thailand (17,44).

It has been reported that the formulations like 16 parts of *Eclipta prostrata* (*bhringaraj*), 1 part of *Triphala* formula {Emblica officinalis (amalaki), 1 part of *Caltropis gigantean* (arka) and 1 part of *Smilax officinalis* (sariva) mixed with 80 parts of sesame oil and boiled to make a medicated oil which is reported to be used in skin diseases (45)

Conclusion

Eclipta alba is an important medicinal plant having remarkable activities for curing several diseases. Its chemical constituents have wide activities on living cells. Thus the review of literature shows the significant pharmacological activities of *Bhrungaraj* i.e. *Eclipta alba* like hepatotoxicity, antiproliferative, antidiabetic, hypolipedemic and its potential to inhibit the growth of the bacteria and fungus also.

Further scope of Study

The investigation of the plant by the isolation of the newer molecules which will be helpful for the study of the pharmacological activities thus contributing to the human trials.

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