



Review Article

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Eclipta Alba, A bunch of Pharmacological Possibilities- A Review



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Abstract

During literature survey of different plants, we came across a plant named *Eclipta Alba*, with too many different pharmacological actions, which keep motivated us to re-review the world of *Eclipta Alba*. In order to find some more aspects, this review has been summarized with too many works of different scientists across the world. During this task, we found that *Eclipta alba* has too many chemical constituents like Coumestans, Luteolins, Flavanoids and Glycosides which are responsible for their variety of pharmacological actions such as Immunomodulator, Antimicrobial, Anti-inflammatory, Analgesic, Anti-hyperglycemic, Anti-anaphylactic, Anthelmintic, Anti-viral, Ovicidal, Anti-hypertensive, Hepato-protective, Anti-cancer, Antioxidant etc. it is also used as anti-venome.

Keywords: *Eclipta alba*; Chemical constituents; Pharmacological activity

Introduction

The commonly using herb i.e. *Eclipta alba* (Linn.) Hassk [Synonym-*Eclipta prostrata* (Linn.), (Family-Asteraceae)] is also said to be “Bhamgra” (Hindi), “Bhringarajah” (Sanskrit), “Kadiggagaraga” (Kannada). There are ten auspicious herbs in which *Eclipta alba* is one of the herb that constitute the group dasapusam [1]. The herb is commonly moisture loving and creeping. Basically in India it is founded on roadsides and waste lands [2]. Throughout India the plant is distributed in moist or wet wasteland that is ascending up to 2000mt on the hills [3]. The Leaves of *Eclipta alba* are sessile to sub-sessile, opposite, 1.2-2.3cm wide usually oblong, 2.2-8.5cm long, sub-acute or acute and lanceolate having appressed hair on both surfaces [4]. The plant has been used for the treatment of Kapha and Vata imbalances in Ayurveda, [5]. *Eclipta alba*, a herb contains mainly demethyl wedelolactone, coumestans, i.e. wedelolactone, polyacetylenes, polypeptides, triterpenes, steroids, flavonoids, (luteolin, luteolin-7-O-glucoside), derivatives of thiophene, alkaloid ecliptine and the ubiquitous stigmaterol [6]. The anticancer, analgesic, antileprotic, antianaphylactic and antioxidant properties are founded in all parts and chemical constituents of *Eclipta alba*

[7]. *Eclipta alba* is also having the antihepatotoxic, antimyotoxic, antibacterial, antiviral, hypotensive, ovicidal, spasmogenic activity and the plant is a promoter for growth and blackening of hair [8]. The aqueous extract of *E. alba* was evaluated to possess significant hypolipidaemic activity [9]. The leaves of *E. alba* are grounded and mixed with water and should be drunk for constipation [10]. The herb is supplied to the problems of gastritis and the respiratory disorders, like cough [11]. And there are the other various pharmacological activities that are possessed by *E. alba*, such as general tonic, memory disorders treatment, edema, rheumatic joint pains treatment and fevers, hepatitis, digestion, enlarged spleen, skin disorders and antioxidant activity. *E. alba* is used as an antiseptic for wounds in cattle and externally for ulcers in Gujrat and Punjab, and in rural areas the plant is reported to treat many microbial infections [12]. The paste of *Eclipta alba* is also beneficial to control eczema and disease of skin. The herb is effective in anemic condition and having antihypertensive action and in case of jaundice, mushroom toxins [13] and the administration of aerial parts of the herb is done.

Taxonomical Hierarchy

- a) Kingdom- Plantae
- b) Subkingdom Viridiaeplantae
- c) Division Tracheophyta
- d) Subdivision Spermatophytina
- e) Infradivision-Angiospermae
- f) Order-Asterales
- g) Family-Asteraceae
- h) Genus-Eclipta L.
- i) Species-*Eclipta alba* (L.) Hassk B

The retrieval of memory is also effectively reported by the administration of *Eclipta alba* [6].

Chemical Constituents

Coumestans

Whole plant of *Eclipta alba* are containing coumestans derivatives that are demethylwedelolactone, wedelolactone and alkaloids and thiophene derivatives and having rapid trypsin inhibitory action [14]. By directly inhibiting the IKK complex, It Suppresses LPS-induced caspase-11 expression in cells that are cultured [11]. The active principle of *Eclipta alba* is wedelolactone and it exhibits antiplasmodial activity, hepatoprotection, relaxant to muscle, sedative, nootropic, anxiolytic and stress reducing activities [15]. The constituent wedelolactone present in *Eclipta alba* has been reported to be useful for treating cancer and hepatitis [16] and to be useful as an antihemorrhagic and antibacterial [7]. Desmethylwedelolactone and Coumestan wedelolactone both of them have been identified as active components which are responsible for antihepatotoxic activity on the basis of *in vitro* studies on rat that are primary cultured, hepatocytes against CCl₄, phalloidin and galactosamine induced cytotoxicity [17].

Luteolins

The leaf extract of *Eclipta alba* is consist of luteolins, which may be responsible for minimizing cognitive deficit because of cholinergic disfunctioning. The profound free radical scavenging action of *Eclipta alba* could insulate neuronal tissues from degeneration probably by preserving these areas from stress perturbations [18].

Flavanoids

The extract of *Eclipta alba* has been observed that the herb exhibits strong activity with the increase in polarity (with reference to organic solvent) and indicating that flavanone or flavanoids or polyphenols may play important roles in the activities [19].

Glycosides

There were four new taraxatane triterpene glycosides, named eclalbasaponins 7-X were isolated from the dried whole plants of *eclipta alba*, along with eclalbasaponins 1-6 [20]. Volatiles oil- The volatile oils are the concentrated liquid and they are having Heptadecane, which is the one of the potent constituent, n-hexadecanoic acid, 6,10,14-trimethyl-2-pentadecanone, eudesma-4 (14), 11-diene, pentadecane, phytol and octadec-9-enoic acid [21]. The effects of the plant extract from the aerial parts of this plant on the proliferation of primary osteoblasts were measured by the MTT method and measuring the activity of alkaline phosphatase (ALP activity) [22].

Pharmacological Study

Snake bite

It is a common and frequently occupational and devastating environmental disease, especially in urban areas of tropical developing countries [23]. Four million snake bites occur each year, has been estimated in Asia alone, of which approximately 100,000 annual deaths while 50% are en-venomed. In Nepal, where more than 90% of the population is engaged in agricultural activities, more than 20,000 snake bites and 1,000 deaths may occur annually according to a World Health Organization report [24]. Sea snakes, whose venom is neurotoxic, but which are not aggressive but most of the Pacific islands are free from venomous snakes [25]. The leaves of *Eclipta alba* are used in the treatment of scorpion stings in Nepal while the herb is used as an antidote for snake bites in Korea [4].

Immunomodulator

One of our most complex biological systems in body is the immune system and the immunomodulatory agents originate from both plant and animal which directly increase the immune responsiveness of the body against pathogens by activating the non specific immune system [26]. *Eclipta alba* leaf extract contains luteolins, which may be responsible for minimizing cognitive deficit due to cholinergic disfunctioning [27]. Their profound free radical scavenging action could insulate neuronal tissues from degeneration probably by preserving these areas from stress perturbations. Protection of neuronal tissues may be possibly due to the immune modulatory actions of *Eclipta Alba*. And the *Eclipta alba* also responsible for the increment of phagocytic index and WBCs count are also significantly increased when test was done by using carbon clearance, antibody titer and cyclophosphamide induced immunosuppression [28]. Therefore, *Eclipta alba* can serve as a potential memory modulator. *Eclipta alba* has been found to activate Na⁺ K⁺ ATPase which produces an elevation in the intracellular concentration of Ca⁺². Stimulation of the Ca⁺² receptor induces the release of 5-hydroxytryptamine. The enhanced turnover of 5-HT can cause blunting of aggression and could be of plausible reason for the antiaggressive property

of *Eclipta alba* [18]. *Eclipta alba* is reported to be effective for the retrieval of memory [7].

Antimicrobial activity

The extract of *Eclipta alba* is active against *A. flavus* and *F. solani* and *A. niger* and inactive against *A. fumigates* [29]. The micro dilution technique as described by the National Committee for Clinical Laboratories standards (2000) by which MIC of wedelolactone was determined. The bacteria inoculums were prepared in 5ml nutrient broth and incubation was done on 37 °C. Approximately 5x10⁶CFU/ml were final inoculums. The Controls is having with 0.5ml of culture medium without the samples while other were using in the tests without microorganisms. The incubation of tubes was done at 37 °C for 24h. And the activity of extract was measured as a function of turbidity at 660nm. Lack of turbidity was further confirmed by pouring suspension aliquot of 0.1ml into pre-sterilized Petri dishes with nutrient agar medium. The tests were performed in triplicate. In DMSO, wedelolactone dissolved at a concentration of 3.5mg/well and 10mg/ml respectively and agar well diffusion method was carried out by favoring perforation of extract. Before inoculating the microorganism, petriplate containing 30ml nutrient agar medium were kept for the solidification. After solidification, the desired numbers of holes of uniform diameter of 8mm were made, using sterile aluminum borer. 0.2ml of compound, positive (Gentamycin) and negative (solvent blank) controls were poured into wells. After incubation for 24h at 37 °C the plates were observed and by measuring zone of inhibition (diameter mm) the compound activity was evaluated. The tests were conducted in triplicate. Gentamycin (10.0µg/ml) was used as positive control. DMSO (10%) was the negative control [12].

Anti-bacterial activity

The antimicrobial activity was studied by using the extracts obtained from the aerial parts. A loopful of gram negative and gram positive bacterial strains such as *S. pyogenes*, *S. aureus*, *E. coli*, *B. cereus*, *K. pneumoniae*, *S. typhi*, *P. aeruginosa* and *P. mirabilis* were inoculated to activate the strain in 30ml of nutrient broth in a conical flask and incubated for 24hrs. The media and the test bacterial cultures were inoculated into petri-dishes, in agar well diffusion method. The test strain 0.25ml was inoculated into the media. Adequate care was taken to ensure proper homogenization. Under strict aseptic conditions the experiment was performed. The first medium is solidified, and after that a well was made in the plates with the help of sterile borer (5mm). The extract compound (50µl) was introduced into the well and the plates were incubated at 37 °C for 24hrs. All samples were tested in triplicates. The microbial growth was determined by measuring the diameter of the zone of inhibition. Ciprofloxacin (25µg) (Himedia, Mumbai, India) was the reference drug used as a control for test organisms [30].

Anti-inflammatory and analgesic activity

To investigate anti-inflammatory activity, the *Eclipta alba* extract was given orally. Carrageenan induced paw oedema

model is used to estimate the anti-inflammatory activity. The release of pro-inflammatory mediators such as prostaglandins (PGs), kinins, tumor necrosis factors (TNF) and nitric acid and activation of platelet activation factors are responsible for inflammation. The *Eclipta alba* extract is having the action as the potent inhibitor of the pro-inflammatory transcription factors because of this action, it is beneficial for the treatment of the inflammatory cascade of cardiovascular diseases [31].

Anti-hyperglycemic activity

The people with diabetes mellitus have more than doubled globally, and which results, most important public health challenges to all nations [32]. And it is the most common disease which is associated with carbohydrate metabolism, affecting about 200 million people worldwide. The suspension of leaf was given by oral intragastric tube. After 60 days of treatment, the rats were fasted overnight and sacrificed by cervical decapitation. The blood glycosylated hemoglobin and glucose were estimated. The rat liver was dissected out and immediately washed thoroughly with ice-cold saline. Potter-Elvehjem homogenizer was used to homogenize the portion of tissue, and the extract was used for the estimations of glucose 6-phosphatase, protein, fructose 1,6-bis-phosphatase, hemoglobin, hexokinase, inorganic phosphorus, and blood urea using a semi-autoanalyzer. The values decreased very much in *E. Alba* administered animals showing the influence of the leaf suspension on sugar reduction. In conclusion, we have demonstrated that the folk medicinal plant *E. Alba* possesses a hypoglycemic effect [33]. It is a potent antihyperglycemic agent [34].

Anti-anaphylactic activity

By using different animal models, the antianaphylactic activity of alcoholic extract of *Eclipta alba* was studied. Each petri dishes were incubated for 10min at 37 °C and then to each petri dish 0.1ml of compound 48/80, a mast cell degranulator used to induce mast cell degranulation, having concentration of 10µg/ml was added and again incubated for 10min at 37 °C. After that, all the pieces were transferred to 4% HCHO solution which containing 0.1% toluidine blue and kept a side for 20 to 25 minutes. After fixation and staining, mesentery pieces were transferred through acetone and xylene two times and mounted on slides. All the pieces were kept under light microscope with 450x magnification and examined. Disrupted mast cells were determined and minimum of 100 cells were counted and percentage of intact. Disrupted mast cells were stained with toluidine blue and undisrupted mast cells remain as such almost round shaped. Percentage protection from degranulation of mast cells by the drug was determined [35]. Hair growth & Alopecia-In hair oil preparations, the extract of *Eclipta alba* is used since it enriches hair growth and maintains hair black. *Eclipta alba* (10%w/v) was an important ingredient in the preparation of herbal formulation for hair growth. Alopecia is a dermal disorder with psychosocial implications on patients with hair loss. It is a well-known Ayurvedic herb for hair growth. A reported work was done in which an ethanolic extracts & petroleum ether

were drawn into oleaginous cream and applied on shaved denuded skin of albino rats. To know the effect of *Eclipta alba*, it is necessary to record the both time (in days), hair growth initiation as well as completion of hair growth. The 2% solution of Minoxidil was applied on skin and served as positive control for comparison. The treatment with 2 and 5% petroleum ether extracts result were better than the positive control that was minoxidil treatment [36].

Anthelmintic activity

The anthelmintic activity was performed according to the method of Ghosh. on adult Indian earthworm *Pheritima posthuma* as it has anatomical and physiological resemblance with the intestinal roundworm parasites of human beings. *Pheritima posthuma* worms are easily available and used as suitable model for screening anthelmintic drugs. In the 50ml of formulations containing four different concentrations of methanol extract (25, 50, 75 and 100mg/ml in normal saline) and standard (20mg/ml) were prepared and approximately equal sized six earthworms were released in each group. Observations were made for the time taken to paralyse or death of individual worms. Paralysis was said to occur when the worms do not revive even in normal saline. Death was concluded when the worms lose their motility followed with fading away of their body color. Albendazole (20mg/ml) was used as standard while normal saline as control [37].

Anti-viral activity

The *in vitro* method for the extract of *Eclipta alba* showing strongly inhibited RNA dependent RNA polymerase (RdRp) activity of HCV replicase. It did effectively inhibit the replication of HCV which was responsible in reduced HCV RNA titer and viral proteins translation level in cell culture system. The extracts which are based on bioassay (response checked in living tissue) and the purification of their phytochemicals have identified three potent chemical compounds, apigenin, wedelolactone, and luteolin. The inhibition of HCV replicase *in vitro* and anti-HCV replication activity in the cell culture system is exhibited by those phytochemically derived compound. The standardized extract of *Eclipta alba* or its constituent can be generally used as an effective treatment against HCV replicase [38].

Ovicidal activity

The eggs of *Ae. Aegypti* were gathered from that laboratory which is vector controlled. To achieve various concentrations ranging from 100 to 350ppm, the extract of leaf diluted in the suitable solvent. Eggs of *Ae. Aegypti* (100 nos.) were disclosed to each concentrations of extract until they deformed or died. The eggs from each concentration were individually lifted to distilled water cups after treatment for hatching evaluated after counting the eggs under microscope. Each trial was recreated six times. The rates of hatching were measured 48h post treatment by following formula [39].

$$\% \text{ of egg mortality} = \frac{\text{Number of hatched larvae}}{\text{Total no of eggs}} \times 100.$$

Anti-hypertensive activity

The active constituent and the ethanolic extract of *E. prostrata* showed remarkable hypertensive activity on rats. The thiophene acetylenes, active constituent, culumbin are enriched in roots and which exhibited noticeable antihypertensive activity [5]. Therefore, *Eclipta alba* is a cheap herbal therapy, offer safe & effective measure to produce a potent action on an biggest people's health problem of high blood pressure [5].

Hepato-protective activity

Generally, the herb is used as a deobstruent (removes obstructions in the body via opening the duct) and cholagogue (promotes the discharge of bile) in hepatomegaly, for jaundice (yellowish and greenish pigmentation), and other ailments of the liver and gall bladder. And the chemical constituents derived from *Eclipta alba* also showed a consequential effect on formation of new liver cell [40]. There was a survey done on total twenty two formulations, among which *Eclipta alba* (bhringraj) was adjacent in 16 hepatoprotective herbal formulations. Among these Formulation, the formulation H contains 750mg of bhringraj and 600mg of kasani per 10ml of dose which was the highest amongst all other formulations [41]. The hepatoprotective effect of *Enicostemma littorale* Blume and *Eclipta alba* was performed by Baranisrinivasan et al. [1] during the oxidative stress induced by ethanol in albino rats [42]. Six albino rats of either sex were taken weighing between 180 and 220gm. The oral administration of 25% carbon tetrachloride in liquid paraffin at a dose of 1.25ml/kg daily was induced for five days. The loss of alkaline phosphatase and hepatic lysosomal acid phosphatase by (CCl₄) was significantly rehabilitated by *Eclipta alba* [8]. *Eclipta alba* is responsible for hepatoprotective activity because the levels of hepatic microsomal drug metabolizing enzymes is regulated by *Eclipta alba* [43]. The loss of hepatic lysosomal acid phosphatase and alkaline phosphatase by (CCl₄) was significantly restored by *Eclipta alba*. Hepatoprotective activity of *Eclipta alba* is by regulating the levels of hepatic microsomal drug metabolizing enzymes [41].

Anti-cancer activity

The crude methanolic extract of *Eclipta alba* has been tested for its *in vitro* inhibitory effect against normal intestinal cells and a panel of colon cancer using MTT cytotox assays. The extract of this plant interfere with the multiplication of colon cancer cells, depend upon the concentration and more cytotoxic to cancer cells than to normal cells. The cancer cell lines for further test and assay methods were sent to cancer cell lines, New Delhi to obtain the results [44].

Antioxidant activity

Antioxidants play an important role in barricade and scavenging free radicals, and providing the defence mechanism to

humans against degenerative and infection [45]. There are various method through which the antioxidant activity is measured like:- radical scavenging activity, FRAP, reducing activity, and DPPH assay. The antioxidant capacity was concentration dependent and showed varying effect as increasing the dose from 25 to 100mg/ml [37]. The antioxidant activity of *E. alba* extract was assessed in comparison ascorbic acid which is standard antioxidant (Sigma, Germany) on the basis of scavenging effect of the stable 2,2- diphenyl-1-picrylhydrazyl (DPPH) free radical procedure. Lower absorbance of the reaction mixture indicated higher free radical- scavenging activity [46]. The phenols contain hydroxyls that are responsible for the radical scavenging effect mainly due to redox properties. The high quantity of ascorbic acid and phenolic content in *E. alba* can explain its stronger free radical scavenging activity [46].

Miscellaneous activity

The dose of 200mg/kg of alcoholic extract of the plant in rats showed antinociceptive effect. Due to the presence of coumarin compounds, the plant has been reported to possess anti-inflammatory, antinociceptive and bronchodilator activities. And the reports after further studies confirmed the analgesic activity of *E. alba*. Preliminary studies showed the methanolic extract of *E. Alba* is also having immunomodulatory activity. Demethylwedelolactone and wedelolactone isolated from *Eclipta alba* exhibited trypsin inhibition [47]. Recently it has been observed that in alloxan induced diabetic rats the administration of the leaf suspension of *E. alba* showed in significant reduction in glycosylated hemoglobin, blood glucose and a decrease in the activities of fructose 1,6-bisphosphatase and glucose 6-phosphatase and an increase in the activity of liver hexokinase, and hexokinases are having the ability to transfer an inorganic phosphate group from ATP to a substrate. On the basis of recent studies have revealed that the *E. alba* extract provided protection against cold restraint induced gastric ulcer formation in rats [8].

Conclusion

After reviewing above literature we can conclude that various diseases and serious infections are treated by *Eclipta alba* extract. The *Eclipta alba* extract also showed favorable antifungal and antibacterial activity against various specific strains of respective organisms. Because of its highly medicinal values, the plant has great commercial demand which calls for further investigation at the biomolecular level. Because of this, the species needs prime attention for its cultivation and conservation.

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