A review on traditional uses, phytochemistry and pharmacological properties of *Eclipta alba (Linn.) Hassk* - an innumerable medicinal plant.

Abstract

Eclipta alba is a common folk medicinal plant which is generously known as bhringraj in Indian traditional medicine and as false daisy in English. It belongs to the Asteraceae family, found in almost all over the globe specially in tropical and subtropical region with various vernacular names include kesuriya (Bengali), maakaa (Marathi), yerba de tago (Minnesota), Kehraj (Assamese), Karisalankanni (Tamil), galagara (Telugu), bhangaro (Guajarati), bhangaara (Hindi). The plant has been traditionally used in folk medicine along with Ayurveda and Siddha for its curative properties where it is utilized as anticancer, antimicrobial, analgesic, anti-venom, antioxidant, antimytotoxic, antihyperglycemic, immunomodulatory properties. A broad range of chemical components including alkaloids, coumentans, flavonoids, polyacetylenes, triterpenes, thiopenes and their derivatives have been extracted from this species. These phytochemicals show different pharmacological activities against several common diseases. This contribution provides update about isolated and identified chemical compounds from the plant extract and their traditional and pharmacological activities.

Key words: Eclipta alba (L.), Coumestans; Antimicrobial; Folk medicine, Asteraceae

Introduction

From the very beginning of civilization people are using many plants in the traditional medicine and nowadays also in the modern medicine as the synthetic medicine has so many side effects and drawback. The presence of chemical molecules in these plants are mainly responsible to the medicinal properties which helps to discover new drugs[1].

Eclipta alba is a well-known traditionally acclaimed medicinal herb all around the world specially in tropical and subtropical countries. It belongs to Asteraceae sub family[2] which is a tribe of Heliantheae itself[3], commonly known as false daisy in English[4] and bhringoraj or bhringraj ayurvedic, and unani systems of medicine. For the uses as hepatoprotective drug in the indigenous system of medicine it is called as “King of hairs”[5]. In the Asian subcontinental this plant extract is uses against snake bites, for hair growth, for gastrointestinal diseases, for respiratory diseases, against cut and wounds, neuroprotection, to treat inflammation and many other diseases[2, 6-10]. In Africa, it is uses for its neuropharmacological properties. It also uses to treat microbial diseases, fungal infections and child convulsions[11].

Due to the multiple properties of E. alba it has been paid wide attention by the researchers and several investigations on biomolecules and pharmacological activities have been conducted which found this herb riches with phenolic compounds, alkaloids, steroids, polyacetate and polysaccharides. Although there are several reviews have been published concerning with E. alba, they did not cover all aspects of this plant and also in the prior no review indicates the antimicrobial activities of the plant extracts of E. alba[12]. Thus, we summarize all the aspects of this plant extracts on traditional uses, Phyto constituents,

antimicrobial activities and highlights the current status and future directions that will provide a figurative overview of this tremendous medicinal plant.

Data Retrieval

We used several free online scientific databases to retrieve relevant information from literature articles published before May 2020 about *Eclipta alba* like Google Scholar (https://scholar.google.com), Baidu Scholar (https://xueshu.baidu.com), PubMed (https://pubmed.ncbi.nlm.nih.gov) and different local books. "*Eclipta albaa*", "Traditional uses", "Phytochemistry", "Pharmacology", "Eclita chemistry", "Eclipta phytochemistry", "Antimicrobial activity" were used as keywords. We verify the taxonomy of the plant from the "The Plant List" (http://www.theplantlist.org).

Physical Characterization and Distribution

Eclipta alba is a small multibranched annual herbaceous plant with white flower head which belongs to a composite family[13]. Leaves are 4-10 cm long and 0.8-2 cm wide and up to 90 cm tall with slender, stiff hairs, reddish stems and rooting at the lower node[14]s. Flowers found on the plant throughout the year and probably September to October is the fruiting period[15]. In the Asian subcontinental, two types of E. alba found which can be classified according to their flower color that is white and yellow. One another type of E. alba found which fruit color is black. *Eclipta alba* normally grows well in the moist or wet place so why they frequently found by the riverside, lakes and drain[16]. Picture of *Eclipta alba* have been shown on figure 1.

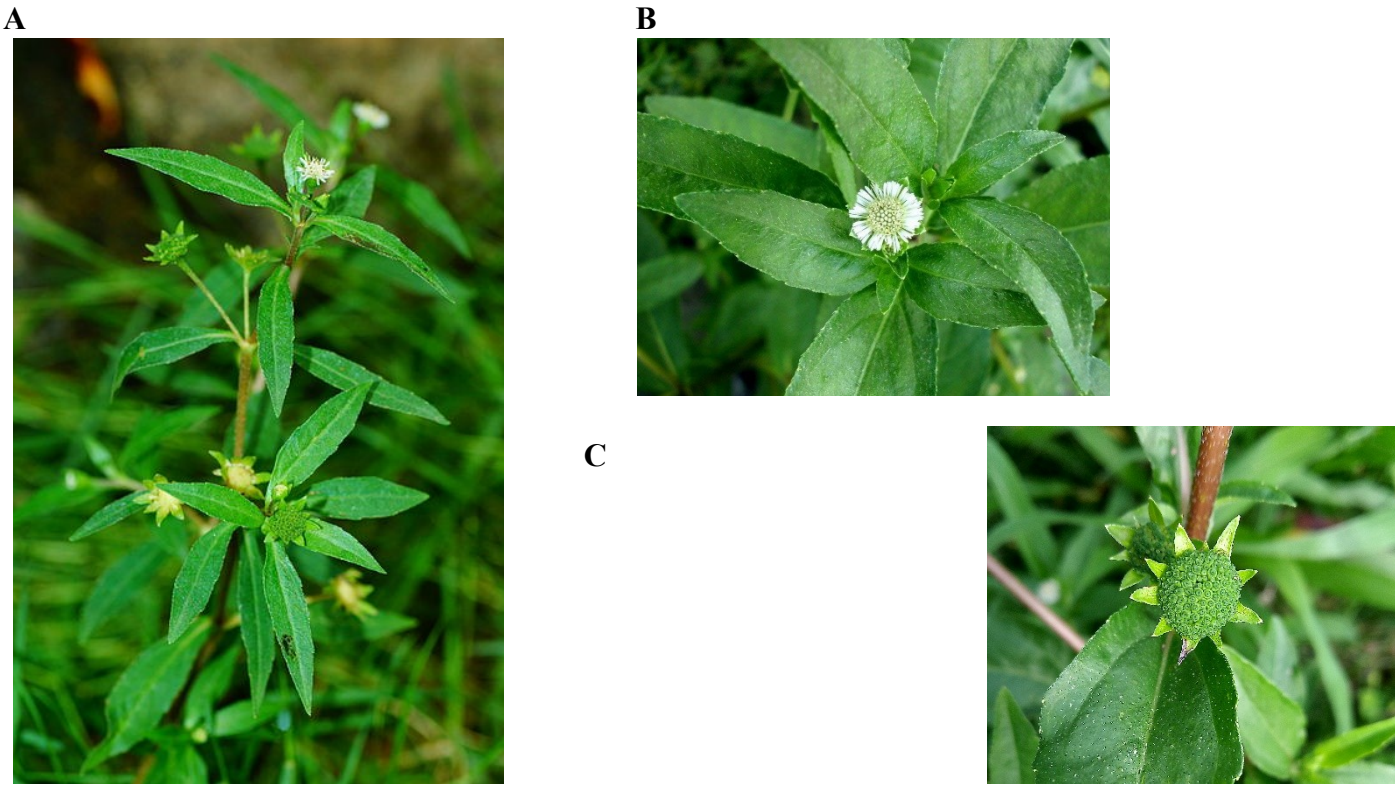

Figure 1: *Eclipta alba* (A), Flower (B) and Fruit (C)

Traditional Uses

In the tropical and sub-tropical regions like Asia, Africa, and South America E. alba has been using for thousands of years[15]. According to Chinese Pharmacopoeia, E. alba is attributives to the liver and kidney that's why it is used to treat hepatic and renal disease. It is also used to treat as a tonic and diuretic in hepatic and spleen enlargement[17]. In India and Bangladesh, the uses of this plant are mostly similar. Both the countries E. alba has broad medicinal value and used for skin disease (e.g. burns and wounds), respiratory disorders, jaundice, diabetes, hair fall, fatigue, and fever[18, 19]. In Thailand, they use different parts of the plant to treat different diseases. There, leaves are used for skin diseases and hair fall; the stems are used as a blood tonic and treat to tuberculosis, and asthma and the root are used as antibacterial[20]. Besides these, in the Brazilian traditional medicine, E. alba is vastly used to treat snakebites, leprosy, and syphilis[21]. Details of traditional uses of the plant in different countries are shown in Table 1.

Table-1: Traditional uses of Eclipta alba

Traditional Uses	Country/Region	Used plant part(s)	Formulations	Reference
Acidity	India	Whole plant	Plant extraction is prescribed with cow milk 3 times daily for 15 days before each meal.	[19]
Alopecia	India	Leaf	Leaf extract with other plant extract is given orally twice a day for three months.	[19]
Allergy, athelete's foot and ringworm	Pakistan	Leaf	Leaf paste is used to the affected parts	[22]
Asthma	India, Thailand	Whole plant	Plant ash is given orally with honey thrice a day for 3 months.	[19, 20]
Amoebiasis, Anaenia, Asthma	Thailand	Stem	Specific method is still to discover	[20]
Body pain	India	Leaf	Treated with fresh leaf extract orally twice a day for 5 days or till the patient recovers.	[19]
Bronchitis and pneumonia	India	Whole plant	Decoction of whole plant is given orally with honey twice a day for 7 days.	[19]
Blood tonic, abscess, itching, haemorrhoid, anaemia, tuberculosis, amoebiasis, asthma	Thailand	Stem	N/A	[23]
Burns	India	Whole plant	Leaf paste is used for the external uses and also plant extract is given orally twice a	[19]

			day for 15 days.	
Catarrhal problems	Nepal	Whole plant	Plant juice with essential oil	[24]
Constipation	India	Root	Powder is given orally once a day for 3 days	[19]
Chicken pox	Bangladesh	Leaves and stem	Plant extract with mustard oil applied to te skin	[25]
Cold	Sidha	Leaf	Leaf juice with equal amount honey	[24]
Coronary heart disease	China	Whole plant	15 g extract is equal to about 30 g raw herb twice a day	
Cuts and wounds	Nepal	Whole plant	Plant extract is applied in the affected parts.	[26]
Diarrhea and dysentery	India	Whole plant	Whole plant decoction is given orally thrice a day for 7 days or till complete cure is obtained.	[19]
Fever	India	Whole plant	Plant extract is given orally twice or thrice a day for 7 days or until the patients recover fully.	[19]
General weakness	India	Whole plant	Plant extract mixed with three gm of Phyllanthus emblica L. powder is given orally twice a day for 6 weeks or till the patient fully recovers.	[19]
Gingivitis	India	Leaf	Leaf extract is given orally twice a day for 3 weeks or till complete cure is achieved.	[19]
Hemorrhoids	India	Root	Root extracts 3 times in a day	[19]
Hair dying	Thailand	Leaves	The specific method of use is unclear	[20]
Hair fall	India	Leaf	Leaf extract 2 times daily with cow milk for 3 months.	[19]
Hair falling	Bangladesh	Leaf	Leaf extract with cow milk two times a day	[18]
High blood pressure	India	Whole plant	Plant decoction twice or thrice a day for three months.	[19]
Hemoptysis of pulmonary tuberculosis	Philippines	Whole plant	Dried plant or tincture used to treat	[24]
Jaundice	India	Whole plant	Plant extract with honey is given twice or thrice daily for 15 days.	[19]
Liver Enlargement	India	Whole plant	Plant extract 2 or 3 times daily	[19]
Loss of appetite	India	Leaf	Leaf extract before each meal for 15 days	[19]
Oedema	India	Whole plant	Herb extract 2 times a day	[19]
Palpitation	India	Leaf	Leaf extract with honey thrice a	[19]

			day	
Paronychia	India	Whole plant	Plant paste used externally.	[19]
Pimples	India	Leaf	Fresh leaf extract with honey given orally	[19]
Premature graying of hair	India	Leaf	Leaf extract used on hair	[19]
Skin diseases	India	Whole plant	Paste used externally for 15 days	[19]
Skin disease	Thailand	Leaf	N/A	[23]
Spleen enlargement	India	Leaf	Extract mixed with honey, 2 or 3 times daily	[19]
Tuberculosis	Thailand	Stems	The specific method of use is unclear	[20]
Snake Bite	India	Whole plant	Oral administration of plant extract	[27]
Urinary tract infection	India	Whole plant	Plant extract administrated orally 2 or 3 times in a day. Also used to wash genitalia externally.	[19]
Weakness of vision	India	Leaf	Leaf extract with cow milk is given orally twice a day.	[19]
Wounds	India	Leaf	Leaf extract is used to wash wounds.	[19]
Wrinkles	India	Leaf	Leaf extract combined with other herb's root powder is given with cowmilk 2 or 3 times a day for 3 months.	[19]

Compounds extracted from Eclipta alba

A wide range of primary and secondary metabolites have been extracted from the plant *Eclipta alba* which includes alkaloids, alkenynes, cardiac glycosides, steroids, triterpenes, phytosterol, flavonoids, coumestans, glycosides, triterpinoidds, saponins. From these, flavonoids, triterpenes, coumestans, steroids are regarded as primary constiuents[12]. Different part of the plant contains different components. Stigmasterol, β terthienylmethanol, wedelolactne, demethylwedelolactone, demethylwedelolactone-7-glucoside are present in the leaves. The roots contain hentriacontanol, heptacosanol and polyacetylene substituted thiophene[28]. The aerial part of the plant contains β- glucoside of phytosterol, aglucoside of a triterpenic acid, β-amyrin in the n-hexane extract and luteolin-7-glucoside. Cystine, glutamic acid, phenyl alanine, tyrosine, methionine, nicotine and nicotinic acid also found in this plant[29].

Coumestan

Coumestan, a derivative of secondary metabolites phytoestrogen which is normally found in the vascular plants. Its construct the central core of different compounds which are collectively known as coumestans. Phytochemical investigation of *Eclipta alba* in different previous study revealed that this plant contains a large amount of coumestans. The major coumestan extracted from the Eclipta alba species includes wedelolactone (0.5-0.55%) and desmethylwedelolactone
[30]. The other coumestan isolated from this plant are demethylwedelolactone-7-glucoside, coumestan, strycholactone and isodemethylewedelolactone[31].

Steroidal Alkaloids

Till date, the total number of extracted steroids from *Eclipta alba* is thirteen. Eight of them isolated by the Abdel-kader et al. (1998) from bioassay-guided fractionation of the MeOH extract of leaves using three yeast strains (1138, 1140 and 1353) and six new alkaloids were reported for the first time from nature. The major alkaloids found in the *Eclipta alba* is [(20S) (25S)-22,26-imino-cholesta-5,22(N)-dien-3β-ol] known as verazine. The other alkaloids found in this plant are [20-epi-3-dehydroxy-3-oxo-5,6-dihydro-4,5-dehydroverazine], [(20R)-20-pyridyl-cholesta-5-ene-3β,23-diol] (ecliptalbine),[(20R)-4β-hydroxyverazine], [4 β -hydroxyverazine], [(20R)-25 β -hydroxyverazine] and [25 β -hydroxyverazine].Beside these, other types of steroids including stigmasterol, daucosterol and β-sitosterol aslo have been extracted[31, 32].

Flavonoids

Flavonoids are important organic compounds found in various plants as secondary metabolites having a polyphenolic structure. It is common in almost every medicinal plant and more than 10 flavonoids have been isolated from *Eclipta alba's* areal parts in the forms of flavonoids, flavones and isoflavones. Zhao et al. in 2002 isolated one flavonol called quercetin from the areal parts of the plant. They used column chromatography with silica gen and HPLC. *Eclipta alba* contains several types of flavones including their glycosides, these are luteolin, apigenin, diosmetin, apigenin-7-o-glueoside, buddleoside and luteolin-7-o-glucoside[33-36].Isolated isoflavones in previous several studies are paratensein, orobol and their subtypes 7-O-methylorobol-4′-O-β-D-glucopyranoside, Pratensein-7-O-β-D-glucopyranoside and 3′-O-methylorobol which have been found in the aerial part of the plant[23, 33, 35, 37, 38]. Flavonoids are recognized in the medicinal community for anti-HCV, osteoprotective, anti-inflammatory and anti-HIV effects[20, 23, 35, 39].

Table 2: Chemical components found in Eclipta alba

Types of phytoconstituents	Parts	Chemical constituents	Pharmacological activities	References
Coumestan	Leaves	Wedelolactone, demethylwedelolactone, demethylwedelolactone-7-glucoside	Anticancer, antihepatotoxic, trypsin inhibitor, antivenom, antihepatotoxic, antihemorrhage, antivenom, dye	[30, 32, 40-42]
	Whole plant	Wedelolactone, demethylwedelolactone, isodemethylewedelolactone Coumestan and		

		strycholactone, ,	(cosmetic), and antihepatotoxic	
Alkaloids	Leaves	[(20S) (25S)-22,26-imino-cholesta-5,22(N)-dien-3β-ol] (verazine), [20-epi-3-dehydroxy-3-oxo-5,6-dihydro-4,5-dehydroverazine], [(20R)-20-pyridyl-cholesta-5-ene-3β,23-diol] (ecliptalbine), [(20R)-4β-hydroxyverazine], [4 β -hydroxyverazine], [(20R)-25 β -hydroxyverazine], [25 β -hydroxyverazine]	Lipid lowering, Analgesic	[43]
Flavonoids	Aerial parts	Luteolin-7-o-glucoside, luteolin, apigenin, orobol (isoluteolin), Quercetin, Buddleosid, Apigenin-7-O-glueoside, Diosmetin, 7-O-methylorobol-4′-O-β-D-glucopyranoside, Pratensein, Pratensein-7-O-β-D-glucopyranoside, 3′-O-methylorobol, Orobol, Oroboside, Orobol-5-O-β-D- glucopyranoside, 3′-O-methyl orobol-7-O-β-D-glucopyranoside	Anticancer, antioxidant, antiallergic, and antiinflammatory	[2, 33-38, 44-46]
Terpenoids and their glycosides	Whole plant	eclalbosaponins I–VI	Anticancer, antiproleferative, antigiardial, hepatoprotective, antiinflammatory, antihyperlipidemic, and hair revitalizing	[2, 32, 33, 35, 45-51]
		Eclalbasaponins VII–X		
		Ecliptasaponins A-D		
		Oleanolic acid Echinocystic acid Eclalbatin		
	Aerial part	β-amyrin 3,16,21- trihydroxy-olean-12-en-28-oic acid 3-oxo-16α-hydroxy-olean-12-en-28-oic acid β-amyrone 3β,16β,29-trihydroxy oleanane-12-ene-3-O-β-D-glucopyranoside 3,28-di-O-β-D-glucopyranosyl-3β,16β-dihydroxy oleanane-12-ene-28-oleanlic acid Silphioside B Silphioside E Echinocystic acid-28-O-β-D-		

		glucopyranoside Echinocystic acid-3-O-(6-O-acetyl)-β-D-glucopyranoside 3-O-(2-O-acetyl-β-D-glucopyranosyl) oleanolic acid-28-O-(β-D-gluco-pyranosyl) ester 3-O-(6-O-acetyl-β-D-glucopyranosyl) oleanolic acid-28-O-(β-D-gluco-pyranosyl) ester 3-O-(β-D-glucopyranosyl) oleanolic acid-28-O-(6-O-acetyl-β-D-glucopyranosyl) ester 3-O-β-D-glucopyranosyl-(1→2)- β-D-glucopyranosyl oleanlic-18-ene acid-28-O-β-D-glucopyranoside		
Sterol		Stigmasterol, daucosterol, stigmasterol-3-O-glucoside		
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	Anti-HIV activity, mosquito larvicidal and ovividal	[2, 20]
Terthienyl aldehyde		Ecliptal		
Fatty alcohols	Root	Hentriacontanol, heptacosanol		
Volatile oils	Aerial parts	Heptadecane, 6,10,14-trimethyl-2-pentadecanone, *n*-hexadecanoic acid, pentadecane, eudesma-4(14),11-diene, phytol, octadec-9-enoic ecid, 1,2-benzenediacarboxylic 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	liver stimulator, hair tonic, purgative, nervine, antiseptic, restorative, astringent, anemia, skin disorders, headache, insomnia, and mental disorders	[2]
Saponins	Roots	Eclalbatin (triterpene saponin), dasyscyphin C	Anticancer, antiviral and antioxidant activity	[20, 52]
Polyacetylinic compounds		α-Terthienylmethanol, polyacetylenes, polyacetylene substituted thiophenes	Antibiotic, anti-inflammatory and antibiotic	[53]
Phenolic acids		Protocatechuic acid, 4-hydroxy benzoic acid	Hepatoprotective, antioxidant, antiinflammatory, and anticancer	[2]

Triterpenoids

Eclipta alba contains large amount of several organic components, triterpinoids is one of them. It contains a large class of triterpinoids wchich exist in the plant in the form of glucosides, known as triterpinoids saponins. Till date, about thirty-seven triterpinoids isolated from this plant. The major triterpinoids exist in this plant are: eclalbasaponins I-XIII, ecliptasaponin A-D, oleanolic acid, echinocystic acid, β-amyrin, ursolic acid, α-amyrin and their derivatives[32, 33, 45-49]. From these, Ecliptasaponin C and D are the new triterpenoid glucosides which have been isolated from the whole plant of E. alba[54]. Beside these, α-amyrin, β- amyrin, ursolic acid, oleanolic acid, and wedelic acid are also the newly isolated triterpinoids[47, 48]. They all have pentacyclic ring structure and subdivided into four skeleton types including oleanane-type (β-amyrane type), taraxerane-type, ursanetype (α-amyrane type) and lupine-type. The most dynamic triterpinoids are the oleanane one and most common types found in *Eclipta alba* are Eclalbasaponins and ecliptasaponins. Some triterpinoids isolated from this plant have been show different biological activities including cytotoxic, hypoglycemic, anti-fibrotic and anti-osteoporotic effects[55-58]

Volatile compounds

In the year 2009, Lin, Xiong-Hao, et al isolated total 55 compounds from aerial part of the plant. In their study where they found most of the (91.7%) chemicals volatiles extracted by hydrodistilation procedure and analyzed by GC-MS matching mass spectra with a mass spectrum library (NIST 05.L).The major volatile components they found were as follows: heptadecane (14.78%), 6,10,14-trimethyl-2-pentadecanone (12.80%), n-hexadecanoic acid (8.98%), pentadecane (8.68%), eudesma-4(14),11-diene (5.86%), phytol (3.77%), octadec-9-enoic acid (3.35%), 1,2-benzenedicarboxylic acid diisooctyl ester (2.74%), (Z,Z)-9,12-octadecadienoic acid (2.36%), (Z)-7,11-dimethyl-3-methylene-1,6,10-dodecatriene (2.08%) and (Z,Z,Z)-1,5,9,9-tetramethyl-1,4,7-cycloundecatriene (2.07%). Volataile components shows positive effects on proliferation and differentiation of primary osteoblasts and stimulates their growth[59].

Neuroprotective effects

In previous several study, *Eclipta alba* have been studied for its neuropsychiatric effects on different animal models. One of the flavonoids found in this plant luteolin showed excellent result against different neural diseases. Luteolin extracted from methanolic solution of E. alba showed anticonvulsant effect which is caused by acute pentylenetetrazole in mouse model. This compound is also suggested for the treatment of epilepsy[10]. It also shows beneficial effects against autism spectrum disorders, Alzheimer's diseases, Parkinson's disease, diabetes associated cognitive disease, traumatic brain injury and multiple sclerosis. Several studies support these neuroprotective activities of this flavonoid[60-67].

In a recent study showed that hydroalcoholic extract of *Eclipta alba* works against global cerebral ischemia in adult wister albino rats which were treated with 250 and 500 mg/kg/day,

p.o. *Eclipta alba* extract for 10 days. *Eclipta alba* helps to pretreatment ameliorates cerebral ischemia injury and enhances the antioxidant defense against BCCA occlusion induced I/R in rats[68].
On a preview study from Laboratory of Biochemistry and Applied Chemistry of University Ouaga I Pr Joseph KI-ZERBO found the alcoholic extract of *Eclipta alba* shows inhibitory effects against Alzheimer's disease by inhibit an enzyme acetylcholinesterase associated with this disease[13].

Antivenom properties of E. Alba
The chemical constituents isolated from Eclipta alba have been showed very effective against various venom from snake bite in the pantropical and subtropical region. Pithayanukul et al. studied the butanolic and purified butanolic extracts of this plant and found the antivenom, hemorrhagic and phospholipase A2 effects against a Thai snake *Calloselasma rhodostoma*[7].In other several studies, another compound found in the Eclipta alba named wedelolactone have been exerted anti-venom activities against South American crotalid venoms of *Crotalus durissus terrificus*[69], *Bothrops jararaca, Bothrops jararacussu and Lachesis muta*[70], *Crotalus viridis viridis* and *Agkistrodon contortrix*[71].

Antimicrobial effect
It has been observed that different chemical components isolated from *E. alba* showed activities against *E. coli, Shigella dysenteriae, P. aeruginosa, Staphylococcus epidermidis, Salmonella typhi, S. aureus, Klebsiella pneumoniae* and *B. subtilis*. Ethanol and ethyl acetate extracted from the aerial part of *E. alba* showed the most antimicrobial activity. On the other hand, hexane and water extract exhibit the lowest activity against microbes[41, 43]. An active compound saponin fraction found in the leaves of E. alba shows antifungal activity. Another compound 25-betahydroxyverazine also showed good antifungal activities against *Candida albicans*[43]. Different extract of E. alba with solvent like petroleum ether, chloroform and ethanol showed in vitro antifungal properties against *Trichophyton spp*, *Candida tropicalis, Rhodotorula glutinis* and *Candida albicans*[72, 73]. In a study it has been found that the leaves extract of E. alba showed the antimalarial properties against *Plasmodium berghei* ANKA strain in mice[74].
Hair growth promoting activity
From the beginning of folk and traditional medicine, E. alba is using in hair oil to treat alopecia and maintaining black color of hair. Alopecia is a dermatological disorder where patients suffers from hair loss with physiological implications[73]. E. alba helps to block the mechanism of hair loss and promotes hair growth. It is also used as hair dye to maintain the natural color of hair[8].

Role in osteoblast differentiation
Osteoblasts are one type of cells which are found in the vertebrate bones and synthesis the bone collagen matrix. They also participate to mineralize the matrix, which gives them strength. One flavonoid, diosmetin (1), and two isoflavonoids, 3′-hydroxybiochanin A (2) and 3′-O-methylorobol (3), isolated from methanol extract of aerial part of *E. alba* significantly increased the osteoblast differentiation in bone marrow and helps to proliferate bone cells which gives strength to the vertebrate[35].

Antioxidant properties

Eclipta alba shows antioxidant properties in different extract solution. Antioxidant activities of Eclipta alba was determined by several method including FRAP, radical scavenging activity, reducing activity and DPPH assay. In a study Karthikumar, S et al. observed that, hexane, ethyl acetate, ethanol and water extract at various concentration showed antioxidant activities in a concentration dependent manner by ferric thiocynate (FTC). They found in their experiment polyphenols or flavonoids or flavanone exhibit a strong activity with the increase polarity[41]

Conclusion

Eclipta alba (L) is a small branched annual herbaceous folk medicinal plant which provides essential properties against several disease. The plant has been drawn much attention for owing the existence of significant organic compounds for the treatment of many infections and disease. Although the world has so many medicines to treat each disease, they owe some side effects which is much alarming for health. But metabolites isolated from *Eclipta alba* used to treat different disease dos not have any side effect as these components are organic. Clinical investigations have been done on different pharmacological activities like diabetic, proliferative, hypolipidemic, hepatotoxicity etc. This plant also has a greater potential to inhibit bacterial and fungus growth. At the end, further investigation of the plant can open the door of modern medicine by isolating new bioactive molecules which will be helpful for the investigation of different pharmacological activities against uncurable human diseases and will prevent the world from the economic and environmental losses.

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