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Eclipta alba (Family: Asteraceae): A review of botanical, ethnopharmacological, phytochemical and pharmacological studies

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Abstract

A traditional medicinal plant which is native to tropical, subtropical and warm temperate areas of the globe. The plant is distributed as a contaminant in rice seed in France and Philippines. Running water especially floods distributes the seeds from field to field. The plant is common for its medicinal value in alternative systems of holistic health (Ayurvedic, Unani, Homeopathy, Sidha and Chinese) and herbal medicines. Scientific evidence for the folklore claim of the plant has been investigated in many studies but a summary of the data is not available. Detailed literature review of the plant with the recent advancement in research along with therapeutic potentials and scientific evidence are given herein. Databases such as Google Scholar, Elsevier, Science Direct and PubMed have been used to access the literature, thus excluding articles related to ecology, agriculture and synthetic work. The review indicated new potentials for the plant and revealed pharmacological activities supporting the traditional claim. For example, antitumor activity studies of the plant revealed its use for treating tumors. Moreover, clinical studies of the plant extract are mandatory based on safety, efficacy and pharmacokinetic data. The current review may be helpful for researchers intending to extend the research on the plant as well as in the preparation of evidence-based formulations in the pharmaceutical industry.

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Introduction

Botany

The term *Eclipta alba* means "white" which refers to the flower color. The specific name prostrata comes from the Latin "prostratus" and refers to prostrate growth habit of the plant. The procumbent plants from the old-world war were described as *Verbesina prostrata* and erect plants from the new world as *Verbesina alba*. In 1771, Linnaeus transferred the genus Verbesina to Eclipta and changed the name of *Verbesina alba* to *Eclipta errecta*. In 1831, Hasskal restored the specific epithet *alba* and united these taxa under the name of *Eclipta alba* (L). Hassk (Koyama and Boufford, 1981). Umemoto *et al.* (1998) reported that there are two different types of plants, one with round achenes 2.9mm across (R type) and the other with slender achenes 2.1mm across (S type). They applied the name *Eclipta thermalis* Bunge (1833) to the R type, *Eclipta alba* Hasskal (1848) to the S type while retaining the name *Eclipta prostrata* (L.) to the complex type.

Vernacular name: Bhangra, Bhringaraj, Garuja, Maka, Lichang.

Synonyms: Eclipta prostrata L., *Eclipta errecta, Verbesina alba, Eclipta thermalis, Verbesina prostrata*

Family: Asteraceae (Sunflower family).

Habitat: Eclipta alba is abundantly found as a small branched annual herb that grows readily throughout sub-tropical; tropical and warm areas of the Globe (Saraswat *et al.,* 2015).It is widespread in damp places, ditches, near rivers and swamps. It is commonly distributed as a weed in the rice field however, water management entirely determines its abundance in lowland rice fields (Lee and Moody, 1988).

Botanical description: *Eclipta alba* also named False Daisy, a prostrate or erect, roughly hairy and branched annual herb having white flowering heads. The root system is tap root and well developed cylindrical, grayish in color, up to 7 mm in diameter. The stem is branched, herbaceous, cylindrical having white trichomes and brown nodes. Leaves are 2.2-8.5 cm long and 1.0-2.2 cm wide, acute or sub-acute, opposite, lanceolate, oblong, sessile to sub-sessile, with apprised hair on both surfaces (Neeraja and Margaret, 2012).

Inflorescence of the plant: The plant has heterogamous inflorescence, head with biseriate bracts and flat receptacle having slender plumose palea. Corolla is bisexual tubular and five-lobed and those of pistillate flower is ligulate and two-lipped; stamens syngenesious, epipetalous and five in number; ovary unilocular and inferior. Achenes of disc florets are compressed and those of ray florets are warted (Neeraja and Margaret, 2012). The picture of the plant is shown in Fig. 1.

Ethnopharmacology

There are three species of *Eclipta alba*, black fruiting, yellow and white-flowering variety. The white variety is used in many herbal formulations for liver ailments. It is used in catarrhal jaundice, as a tonic in spleen and hepatic enlargement, as diuretic and diseases of the skin. In India, the plant is a constituent of shampoos and hair oil thus promotes healthy and black hairs (Roy *et al.*, 2008). It protects hepatic parenchymal cells by promoting bile flow thus used in the treatment of hepatitis. The fresh leaves juice increases appetite and improves digestion (Lans, 2007). Moreover, memory and intelligence are enhanced by the use of this plant (Banji *et al.*, 2007).

The juice of the leaves in the dose of 5-15 mL twice a day was used to treat haematuria. Common cold in infants was treated by administrating a mixture of an equal volume of honey and leaves juice of the plant (Neeraja and Margaret, 2012). In Pakistan, leaf paste is applied to treat athlete's foot, ringworm and skin allergy (Hussain *et al.*, 2010). In the local community and traditional healers of Nepal, juice of the whole plant is externally applied to treat wounds and cuts (Panthi and Singh, 2013). In Africa, the plant is used in fetal development and help in childbirth (Malan and Neuba, 2011). In Bangladesh, the plant was used traditionally to cure gastric indigestion (Rehmatullah *et al.*, 2010).In occupants of Thar desert (India), the

plant is used as hepatoprotective, anticatarrhal and deobstruent and promotes hair growth. Insomnia is treated by applying a mixture of leaf extract and oil on the scalp (Sharma *et al.*, 2011). In India, jaundice, asthma and urinary problem are usually treated by using *Eclipta alba* leaves and flowers (Gautam and Batra, 2012), while snake bite is treated by using the whole plant (Vaidyanathan *et al.*, 2013). The shoot juice, or root extract with a drop of mustard oil given for 3-4 days once daily to treat diarrhea (Das and Duarah, 2014). The plant in dried powder form provide energy when given to the elderly, while plant in the form of paste applied to blacken grey hair (Sudhakar and Shashikanth, 2012). A leaf decoction is used to cure asthma, cold and to relief headache (Vashistha and Kaur, 2013). Small pills made from plant and black pepper and given twice daily to cure fever and jaundice in infants (Sahu *et al.*, 2013).

Phytochemical constituents

The active phytochemical constituents isolated from different parts of the plant are given in Table 1.

Table 1. Phytochemical constituents of *Eclipta alba* plant.

Part used	Active principle	References
Dried Leaves and Stem	Wedelolactone,desmethylwedelolactone,isodemethylwedelolactone, stigmasterol, strycholactone, ecliptal.	(Bhargava *et al.*,1970)
	Wedelolactone.	(Zhang and Guo, 2001)
Roots	Hydrocarbons like ecliptal, α-formylterthienyl	(Das and Chakravarty, 1992; Zhang *et al.*, 1997)
Aerial parts	Apigenin, luteolin, luteolin-7-glucoside phytosterol, β-glucoside of phytosterol, stigmasterol-3-o-glucoside and daucosterol.	(Zhang and Guo, 2001)
Seeds	Steroidal alkaloids verazine, dehydroverazine, ecliptalbine	(Abdel kader *et al.*, 1998)
Whole plant	Ecliptine and Nicotine.	(Pal, 1943)
	Triterpenene like eclalbatin, wedelic acid α-amyrin, saponin, β-amyrin, oleanolic acid and ursolin acid.	(Upadhyay *et al.*, 2001)
	six new oleanane triterpene glycosides, eclalbasaponin I-VI, polyacetylenic thiophenes 5' senecioyloxymethylene-2-dithiophene,5'-tigloyloxymethylene-2-dithiophene	(Yahara *et al.*, 1994)
Roots	Polyacetylenic thiophenes 5' senecioyloxymethylene-2-dithiophene, 5'-tigloyloxymethylene-2-dithiophenes, stigmasterol, eclalbatin	(Singh, 1988)

Pharmacological activities

Antibacterial activity

The plant (ethyl acetate extract) contains coumestan wedelolactone which exhibit antimicrobial activity against *Staphylococcus epidermidis, Staphylococcus aureus, Shigella flexneri, Salmonella typhimurium, Escherichia coli, Salmonella enteric, Bacillus cereus, Pseudomonas aeruginosa, Bacillus subtilis* and *Proteus mirabilis* using zone of inhibition and minimum inhibitory concentration studies (Dalal and Kataria, 2010; Borkataky *et al.*, 2013). Further literature revealed that extracts (ethanolic) of aerial parts of *Eclipta alba* exhibited significant antibacterial activity against *Staphylococcus epidermidis, Propionibacterium acne, Salmonella typhi*, *Escherichia coli*, *Staphylococcus aureus* and multidrug-resistant strains of *Enterococcus spp* due to presence of coumestans, wedelolactone and demethylwedelolactone in the plant (Kumar *et al.*, 2007; Karthikumar *et al.*, 2007; Lenza *et al.*, 2009). The methanolic extract of the plant has a broader range of activity against *Bacillus cercus, Escherichia coli, Bacillus subtilis, Bacillus megaterium, Klebsiella pneumonia, Salmonella typhi, Pseudomonas aeruginosa, Yersinia enterocolitica, Streptococcus faecalis*, *Proteus mirabilis, Shigella boydii, Shigella dysenteriae* and *Staphylococcus aureus* using Cup diffusion method and nutrient agar diffusion medium (Girish and Satish, 2008; Devi *et al.*, 2010; Prabu *et al.*, 2011; Santhosh *et al.*, 2015). Moreover, studies

reported that eclalbasaponins found in the plant are responsible for antibacterial activity (Kanabiran, 2008; Rehman and Rashid, 2008). Silver nanoparticles of *Eclipta alba* showed significant antibacterial activity against *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* (Premasudha *et al.*, 2015). The plant (alcoholic and aqueous extract) inhibited the growth of *Mycobacterium tuberculosis* having MIC of 1 mg/mL (Maddi *et al.*, 2017). The plant also showed anthelmintic activity against *Phertima postuma* (Reddy *et al.*, 2017).

Fig. 1. *Eclipta alba* plant.

Antifungal activity

Saponin fractions of leaves of the plant exhibited antifungal potential against *Aspergillus niger*, *Aspergillus fumigatus, Alternaria spp., Trichoderma spp* and *Aspergillus flavus*. Hexane, ethyl acetate and ethanolic extracts of plant showed antifungal activities against *Trichophyton mentagrophytes* and Microsporum spp, having MIC 0.15 mg/mL (Raveesha and Shrisha, 2013). The methanolic extract of the plant exhibited significant antifungal activity against *Trichosporon* spp in piedra hair infections by gel diffusion method. The extract exhibited antifungal activity but the active principles in TLC separated bands did not shows antifungal activity suggesting activity may be due to synergism of active principles in the separated TLC bands. The aerial part of the plant (ethanolic extract) showed significant antifungal activity against *Aspergillus ochraceus* and *Trichophyton rubrum* strains (MIC 125 µg/mL) (Lenza *et al.*, 2009). The activity is related to coumestans wedelolactone, demethylwedelolactone and synergistic activity of these coumestans and other compounds in the extract. It has also been reported that apigenin, eclalbasaponin II and wedelolactone found in the plant are responsible for antifungal activity. Hence can be utilized as an alternative to chemical fungicide in the management of Sorghum disease (Sollepura *et al.*, 2019).

Antioxidant activity

Significant antioxidant activity was found in lyophilized butanol extract of the plant using rats as *in vivo* model. A significant decreased in serum hydroxyl radical, lipid peroxide and oxidized proteins level were observed in tested rats. It has been reported that flavonoids, polypeptides, total phenolic and steroidal contents of the plant are responsible for activity (Kim *et al.*, 2008; Yadav *et al.*, 2017). Dave

(2009) reported *in vitro* screening models for the antioxidant activity of the plant which includes nitric oxide radical scavenging assay, hydrogen peroxide radical scavenging assay, hydroxyl radical scavenging assay, free radical scavenging assay, superoxide anion radical scavenging assay, total flavonoid and phenolic content determination, reducing power and xanthine oxidase method. Karthikumar *et al.* (2007) reported ferric thiocyanate method for determining the antioxidant activity of ethyl acetate and ethanolic extract of leaves of the plant. Reddish ferric chloride pigment formed on reaction of peroxide with ferrous chloride was determined by the method with an increase in activity by decreased peroxide ion concentration in the reaction. The plant (methanolic extract) showed significant anti-oxidant activity when determined by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay (Prabu *et al.*, 2011; Cherdtrakulkiat *et al.*, 2015). The assay method showed that DPPH (a stable purple-colored radical) on reaction with an antioxidant form light yellow colored reduced product diphenypicrylhydrazine that can be detected spectrophotometrically.

Hepatoprotective activity

In the carbon tetrachloride-induced hepatotoxicity model, aqueous and alcoholic extract of leaves of the plant showed good hepatoprotective activity in albino rats using dose of 250 mg/kg and 10 mg/kg per orally. The activity has been evaluated by determining and comparing levels of aspartate aminotransferase, alkaline phosphatase, alanine aminotransferase and among different groups of animals (Singh *et al.*, 2001; Thirumalai *et al.*, 2011). Good hepatoprotective activity was shown by alcoholic extract of fresh leaves (10 mg/kg per orally) in rats using carbon tetrachloride-induced hepatotoxicity model. Ethanolic extract of the plant showed good hepatoprotective activity with improved levels of TBARS, GSH and SOD in alcohol-induced albino rats using silymarin as standard (Arun and Balasubramanian, 2011).

The plant exhibit hepatoprotective activity in paracetamol induced hepatoxicity (Indhuleka and Jeyaraj, 2019). A recent study reported hepatoprotective effect of *Eclipta alba* nanoparticles and raw *Eclipta alba*. The study demonstrated that the nanoparticles form of *Eclipa alba* offers protection against diethyl-nitrosamine induced hepatotoxicity and thrombocytopenia (Mugale and Balachandran, 2020).

Hypoglycemic activity

The methanolic extract of the plant showed significant antidiabetic activity in alloxan-induced diabetic rats. The constituents isolated by bioactivity-guided isolation were four echinocystic acids glycosides out of which eclalbasaponin-VI was more potent (Kumar *et al.*, 2012). Coumestans (wedelolactone and demethylwedelolactone) with alpha-glucosidase inhibitory activities were isolated from the aerial part of *Eclipta alba* caused non-competitive inhibition of *Saccharomyces cerevisiae* α-glucosidase. Wedelolactone and demethylwedelolactone strongly inhibited maltase (IC_{50} of 20.2 and 360.6 µM) and sucrase(IC_{50} 20.2 and 238.3 µM) in rat intestine (Prajapati and Patel, 2012). Ananthi *et al.* (2003) reported that plant extract potentiated the liver hexokinase activity and decreased the fructose-1,6-bisphosphatase and glucose-6-phosphatase activities in alloxan-induced diabetic rats. Sazia *et al.* (2015) reported a comparative study of *Eclipta alba* and metformin against diabetes.

Antihypertensive activity

Verma *et al.* (2012) studied *in vivo* effects of *Boerhaavia diffusa* and *Eclipta alba* on hypertension and normal blood pressure in adult Wistar rats of both sexes by tail-cuff method. Comparative analysis was done using amlodipine. Jena *et al.* (2013) reported *in vivo* model for determining antihypertensive activity in rat models. Ethanolic extract of *Eclipta alba* reduced blood pressure significantly in fructose-fed albino rats.

The alcoholic and aqueous extract of leaves of the plant showed an increase in cation and anion excretion and urine volume in rats without causing

any renal toxicity during the study. Furosemide was used as a reference diuretic (Singh *et al.*, 2013).

Antihyperlipidemic effect

Kumari *et al.* (2006) showed that methanolic extract of plant exhibited dose-dependent anti-hyperlipidemic activity in experimental rats. Rangineni *et al.* (2007) showed that dried leaf powder of plant (3 g /day) in encapsulated form reduced blood pressure and lipids level in the age group 40-55 years hypertensive male subjects. A recent study reported the anti-hyperlipidemic potential of *Eclipta alba* in rats induced by a high fatty diet. There is a marked reduction in very-low-density lipoproteins (VLDL) and low-density lipoproteins (LDL) levels in rats treated with *Eclipta alba*. Moreover, the treatment also reduced levels of alkaline phosphatase, serum glutamic pyruvic transaminase and serum glutamic oxaloacetic transaminase (Naik *et al.*, 2019).

Nephroprotective activity

It has been scientifically reported that ethanolic extract of *Eclipta alba* (whole plant) is nephroprotective in curing nephrotoxicity induced by gentamicin in experimental rats. The underlying mechanism of nephroprotection provided by the extract was probably due to ferric ion reducing ability and radical scavenging activity of extract (Dungca, 2016; Thomas *et al.*, 2019).

Anti-inflammatory activity

Arunachalam *et al.* (2009) reported that leaf extract of the plant showed anti-inflammatory activity in albino Wistar rats using standard drugs indomethacin and cyproheptadiene. The ethanolic extract of the plant exhibited antinociceptive and anti-inflammatory and activity in Wistar albino rats (Rahman *et al.*, 2012). The plant exhibited a beneficial effect on paw anaphylaxis induction by anti-serum as well as on various inflammatory cells infiltration and histamine mediator from lungs. This activity may be due to membrane-stabilizing potential, histamine release inhibition and various inflammatory mediators (Patel *et al.*, 2009). The plant showed anti-inflammatory activity by inhibiting LPS-induced capase-11 expression, a regulator of the pro-inflammatory mediator (Kobori *et al.*, 2004). The alcoholic extract of the plant significantly inhibited oedema in rat paw induced by carrageenan as compared to aqueous and hydroalcoholic extract using Indomethacin as a standard drug (Peraman *et al.,* 2011; Patel *et al.*, 2012). One recent study reported that *Eclipta alba* possesses anti-arthritic potential via its antioxidant and anti-inflammatory effect due to the presence of different flavonoids and polyphenols (YRKV and Satishchandra, 2020).

Anti-HCV activity

The plant extract showed significant anti-HCV activity as reported by different *in vitro* and *in vivo* models due to different phytochemicals isolated from the active fraction of plant extract (Manvar *et al.*, 2012). The methanolic extract of the aerial part of the plant exhibited significant inhibition of hepatic stellate cell proliferation (Lee *et al.*, 2008). Five oleanane type triterpenoids were isolated by activity guided fractionation of plant extract out of which eclalbasaponin(II) and echinocystic acid (1) showed remarkable anti-proliferative activity in time dependant and dose dependant manners.

Anti-HIV activity

The bioassay-guided fractionation of whole plant extract led to the isolation of six compounds out of which highest activity exhibited by wedelolactone against HIV-1 integrase(IC_{50} 4.0±0.2μM) and 5-hydroxymethyl-(2, 2´:5´, 2´´) terthienyl tiglate(I) and HIV-1 protease with an IC_{50} value of 58.3±0.8 μM (Tewtrakul *et al.*, 2007).

Anti-venom activity

The ethanolic extract of aerial part of plant neutralized the venom of an American rattle snake due to the presence of wedelolactone, sitosterol and stigmasterol (Mors *et al.*, 1989). Pithayanakul *et al.* (2004) reported that butanolic extract of the plant showed antivenom activity against *Calloselasma rhodostoma* (Malayan pit viper MPV) on the tested mouse by inhibiting proteolytic, phospholipase A_2 and

hemorrhagic activities at a dose of 2.54 mg per experimental rat. Another study reported showed that genetically modified *Eclipta alba* using *Agrobacterium rhizogenes* resulted in the production of secondary metabolites with the highest proportion of wedelolactone in aerial parts and demethylwedelolactone in the roots, thus exhibited anti-venom activity against *Crotalus durrisus terrificus* and *Bothrops Jararacussu* on tested mice (Diogo *et al*., 2009).

Antineoplastic activity

Literature reported that alcoholic and hydroalcoholic extract of *Eclipta alba* possesses apoptotic, antiproliferative and anti-invasive activities (Chaudhary *et al*., 2011; Desirrdy *et al*., 2012). Liu *et al*. (2012) showed the antitumor activity of 30 percent fractions and eclalabasaponin extracted from a plant having IC_{50} values 72.24 and 111.17 µg/mL. It has been scientifically reported that methanolic extract of the plant showed activity in cancer cell lines.

The plant extract induced cellular apoptosis in breast cancer cell lines by DNA and mitochondrial membrane disruption (Yadav *et al*., 2017). Moreover, the literature reported that lipopolysaccharide-induced cell proliferation of human renal mesangial cells is inhibited by wedelolactone isolated from *Eclipta alba* (Shen *et al*., 2017).

Antiviral activity

Eclipta alba in Liv.52 herbal preparation tested on mice experimentally infected with semiliki forest encephalitis virus exhibited antiviral activity (Singh *et al*., 1983). Significant antiviral activity was exhibited by alcoholic extract of plant against Ranikhet disease virus (Ma *et al*., 1978).

Larvicidal activity

The larvicidal activity is shown by silver nanoparticles of the plant against malaria and filariasis vectors (Rajakumar and Rahuman, 2011). *Eclipta alba* leaf extract was used for controlling chikungunya vector, *Aedes aegypti* (Govindarajan and Karuppannan, 2011).

Osteoblast stimulatory activity

Lee *et al*. (2009) reported that methanolic extract of the plant showed significant osteoblast stimulatory activity in the tested mouse. Two isoflavonoids 3´-O-methylorobol (3) and 3´-hydroxybiochanin A (2), one flavonoid and diosmetin were isolated by bioactivity guided fractionation of plant extract.

Wound healing activity

Ethanolic extract of leaves of *Eclipta alba* exhibit significant wound healing potential in ether anesthetized experimental rats at doses of 150 and 300 mg/kg using dead space wound, incision and excision model (Sharma and Sikarwar, 2008).

Memory enhancing ability

The plant has the memory enhancing ability and the immunomodulatory action of the plant protects neuronal tissues. Moreover, cognitive effects due to cholinergic dysfunction are minimized by luteolins isolated from the plant (Banji *et al*., 2007).

The plant also exhibited significant protection against scopolamine-induced memory defects in mice due to its antioxidant and anti-acetylcholinesterase actions. The plant can improve the memory and learning function of AD (Alzheimer's disease) rats by enhancing the expression of BDNF (brain-derived neurotrophic factor) (Wang *et al*., 2015).

Hair growth enhancement activity

The plant extract (ethanolic and petroleum ether) exhibited significant hair growth-promoting activity in experimental rats. The plant extracts after incorporation into oleaginous cream was applied topically on denuded shaved skin of rats using minoxidil 2% as a positive control (Roy *et al*., 2008).

It has been experimentally demonstrated that whole-plant petroleum ether extract has potential use in the treatment of various types of alopecia, by acting as an exogenous mediator which downregulates TGF-β1 expression and delays terminal differentiation, thus stimulating proliferation of follicular keratinocytes (Begum *et al*., 2015).

Pharmacokinetic interactions with other drugs

Bioavailability of paracetamol was not affected on coadministration of drug with wedelolactone as indicated by pharmacokinetic studies. There was no change in C_{max} on coadministration of wedelolactone and paracetamol, but the T_{max} of paracetamol was raised from 2h to 3h without affecting the area under the curve (AUC). Hence plant extract may be used safely in prolonged paracetamol therapy or paracetamol toxicity because wedelolactone exhibits hepatoprotective effect and it doesn't alter paracetamol bioavailability significantly (Sagar *et al*., 2006).

Toxicity studies

Seshadri *et al*. (2014) reported that *Eclipta alba* hydroalcoholic extract had been significantly used in boric acid-induced toxicity of the male reproductive system. Boric acid damages the histology of the liver, reproductive system and kidneys and that can be reversed by treatment with plant extract.

Analytical studies

A simple, rapid and sensitive high-performance liquid chromatographic method with photo-diode array detection (HPLC-PDA) was developed for the identification and quantification of wedelolactone in various extracts of the plant (Kumar and Dhanani, 2013). The resolution was achieved on the C_{18} column in isocratic elution mode using methanol: water: acetic acid (95:5:0.04) as mobile phase and diode array detection at 352 nm.

The detection limit (LOD) and quantification limit (LOQ) was calculated to be 2 and 5 µg/mL, respectively. Percent recovery of wedelolactone was more than 95%. Thapliyal *et al*. (2011) developed HPTLC method to determine wedelolactone in *Eclipta alba* and herbal formulations.

The separation was achieved using silica gel GF_{254} precoated HPTLC plates and ethyl acetate: methanol: water: acetic acid (9:0.5:0.5:0.2) as mobile phase. Detection and Quantification limit was calculated to be 0.3 µg and 0.9 µg.

Isolation of new alkaloids

Abdel kader *et al*. (1998) developed bioassay guided fractionation method for isolation of eight different steroidal alkaloids from methanolic extract of *Eclipta alba*. The major alkaloid identified was (20S) (25S)-22, 26- iminocholesta- 5, 22 (N)- dien -4β -ol (verazine3) while new alkaloids identified were ecliptalbine [(20R)-20-pyridyl-cholesta5-ene-3β, 20 –epi -3- dehydroxy- 3- oxo- 5,6- dihydro- 4,5-dehydroverazine (1), 23-diol](4), (20R)-4β-hydroxyverazine(5), 4β-hydroxyverazine(6), (20R)-25β-hydroxyverazine (7) and 25β-hydroxyverazine (8). Gas chromatography-mass spectroscopic analysis of powdered and methanolic extract of the plant leads to isolation of different bioactive constituents. These include Loliolide – 0.37 and– 44.86, 9-Octadecenamide, (Z)- (CAS) Oleomide - 0.29, 2- Thiophene carbaldehyde and 5-[5-(thien-2-yl) thien-2-yl]- 0.08%, Dodecanoic acid - 0.19 (Naik *et al*., 2019).

Conclusion

The current review provides brief literature regarding phytochemical, botanical, pharmacological and analytical studies of plant, which may be beneficial for researchers, intending to further investigate the plant in the future, and in preparation of evidence-based and stable formulations in the natural pharmaceutical industry.

The review of plant *Eclipta alba* has revealed the scientific evidence that supports various traditional claims. Some of the investigations and research indicated new therapeutic uses of the plant. Hence, concluded that safety, pharmacokinetics and toxicity studies of the plant urge investigation of various types of plant extracts for clinical studies.

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