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ABSTRACT

The plant *Eclipta alba* Hassk [Asteraceae] having important role in the traditional Ayurvedic, Unani systems of holistic health and herbal medicine of the east. *Eclipta alba* Hassk is reported to possess Hepatoprotective, antimicrobial, anti-inflammatory, analgesic, immunomodulatory, antiviral and promoter for blackening and growth of hair. Important source of chemicals is wedelolactone, demethylwedelolactone exhibit antihepatotoxic activities. Hence in view of immense medicinal importance of the plant this review is therefore compile all the information related to *Eclipta alba*.

Keywords: *Eclipta alba*, Bhringraj, Asteraceae, Wedelolactone, Hepatoprotective.

INTRODUCTION

Drugs of natural origin play a significant role in the public health care system of any nation. Indian Materia Medica includes about 2000 drugs of natural origin of which approximately 400 are mineral and animal origin while the rest are of vegetable origin Ayurveda, Siddha and Unani systems 600-700 herbs for medicinal use¹. The World Health Organization (1980) has also recommended the evaluation of the effectiveness of plants in conditions where there is lack of safe synthetic drugs².

Eclipta alba (Linn) Hassk, family Asteraceae, grows as a common weed throughout India, ascending to 1800 m. in the Himalayas, common in areas of upper gangetic plains, in pasture lands, roadsides in Chota Nagpur, all districts of Bihar and Orissa, Punjab, Western India, South India³.

Vernacular Names

Eng.	- Trailing Eclipta.
Hindi	- Bhangra, Mochakand, Babri, Bhangra.
Beng.	- Bheemraja, Kesuriya, Kesari, Kesuti, Keshwri.
Guj.	- Bhangra, Kaluganthi, Dodhak, Kalobhangro.
Kan.	- Garagada, Soppu.
Mal.	- Kannunni, Kayyonni.
Mar.	- Maka, Bhringuraja.
Tam.	- Kaikesi, Garuga, Kayanthakara.
Tel.	- Guntakalagara, Guntagalagara.
Arab.	- Kadim-el-bint.
Assam.	- Bhrngaraja.
Oriya	- Kesara, Kesarda.

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Santhal	- Lal Kesari.
Sind	- Tik.
Sing	- Kikirindi.
Sansk.	- Kesaraja, Tekaraja, Bhrnga, Markava, Bhrngaja.
Punj.	- Bhangra.
Urdu.	- Bhangra ³⁻⁴ .

Parts Used

Whole plant, roots, seeds and seed oil¹⁰⁻¹¹.

Propagation and Cultivation

It grows in wet marshy places. It is easily propagated by seeds. Vegetative propagation of *Eclipta alba* was tried by stem cuttings. The cuttings were planted after dipping them in IBA and GA solution and observed for 60 days. The results indicated that 100 ppm IBA was effective in producing roots and shoots¹¹.

Description of Plant parts



Fig : 1 Photograph of *Eclipta alba*

A. Macroscopic

- 1. Root** – A number of secondary branches arise from main root, upto about 7 mm in dia., cylindrical, greyish.
- 2. Stem** – Herbaceous, branched, occasionally rooting at nodes, cylindrical or flat, rough due to oppressed white hairs, node distinct, greenish, occasionally brownish.
- 3. Leaf** – Opposite, sessile to subsessile, 2.2-8.5 cm long, 1.2-2.3 cm wide usually oblong, lanceolate, sub-acute or acute, strigose with appressed hair on both surfaces.

4. Fruit – Achenial cypsella, one seeded, cuneate, with a narrow wing, covered with warty excrescences, brown..

5. Seed - 0.2-0.25 cm long, 0.1 cm wide, dark brown, hairy and non endospermic.

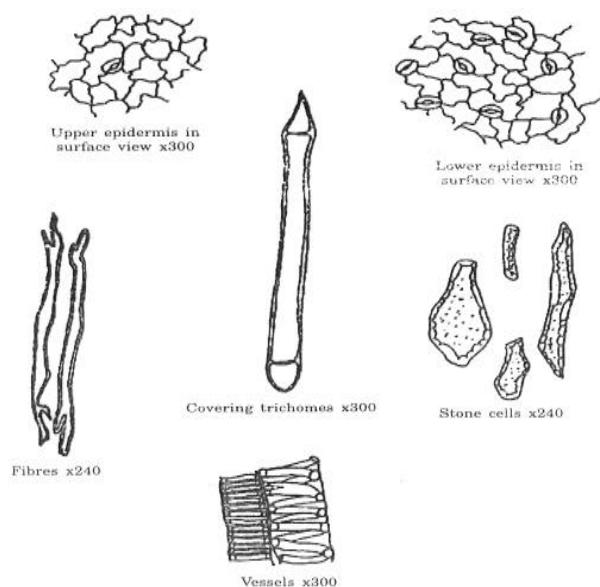
6. Flower – Solitary or 2, together on unequal axillary peduncles; involucre bracts about 8, ovate, obtuse or acute, herbaceous, strigose with oppressed hairs; ray flowers ligulate, ligule small, spreading, scarcely as long as bracts, not toothed, white; disc flowers tubular, corolla often 4 toothed; pappus absent, except occasionally very minute teeth on the top of achene; stamen 5, filaments epipetalous, free, anthers united into a tube with base obtuse; pistil bicarpellary; ovary inferior, unilocular with one basal ovule⁴.

B. Microscopic

1. Root – The cells of outer one or two rows of secondary cortex, elongated or rounded with air cavities. While cells of inner secondary cortex, elongated to irregular in shape. Stone cells scattered in secondary cortex. Phloem rays broader towards the periphery, cells rounded. Xylem rays distinct, run straight in tangential section, rarely uniseriate and biseriate, cells pitted.

2. Stem – A few epidermal cells elongate to form characteristic non-glandular trichomes. Secondary cortex composed of large, rounded parenchymatous cells having wide air space. Vascular bundle in a ring, collateral, endarch, of varying size. Vessels barrel-shaped, some elongated with simple perforation, pitted with spiral thickening. A few xylem fibres bifurcate. Xylem rays uniseriate or biseriate.

3. Leaf – Anomocytic and anisocytic stomata and non-glandular hairs are present on both surface, more abundant on lower side. Vascular bundle, five in midrib, central one largest while four other small flanking either side of central bundle⁵.



Phytochemical Screening

Preliminary phytochemical screening was done to study the presence of protein, amino acids, essential oils, volatile oils, tannins, steroids, carbohydrates, glycosides, alkaloids⁶.

Phytochemical Constituents

The dried leaves of *Eclipta alba* have been reported to contain coumestan derivatives; wedelolactone and demethylwedelolactone⁷, stigmasterol, a-terthienylmethanol, desmethyl-wedelolactone-7-glucoside⁸, unnamed alkaloid⁹, apigenin, luteolin and their glucoside, wedelic acid¹⁰, 25- β -hydroxyverazine¹¹, ecliptine and nicotine¹². The percentage of coumestans in the ethyl acetate fraction of the plant was found to be 3.5 % demethylwedelolactone and 15.9 % wedelolactone⁷.

Roots of *Eclipta alba* have been reported with thiophene acetylenes such as 5^l-senecioid oxymethylene-2-(4-isovaleryloxybut-3-ynyl)-dithiophene, 5^l-tigloyloxymethylene-2-(isovaleryloxybut-3-ynyl)-dithiophene and 2-(3-acetoxy-4-chloro-but-1-ynyl)-5-(pent-1,3-dienyl) thiophene¹³, hentriacontanol, stigmasterol⁸, ecliptal¹⁴⁻¹⁶, 14-heptacosanol¹⁷.

Stems of *Eclipta alba* contain wedelolactone⁸, wedelic acid, L-terthienyl methanol, apigenin, luteolin¹⁰.

Seeds of *Eclipta alba* contain sterols¹⁸.

Aerial parts gave β -amyrin, luteolin-7-0-glucoside⁸. In addition the aerial parts is reported to contain apigenin, cinnaroside, sulfur compounds¹⁹, phytosterol, β -amyrin in the n-hexane extract, luteolin-7-glucoside and wedelolactone in polar solvent extract²⁰.

Twigs of the plant have been reported to contain an unnamed alkaloid⁹.

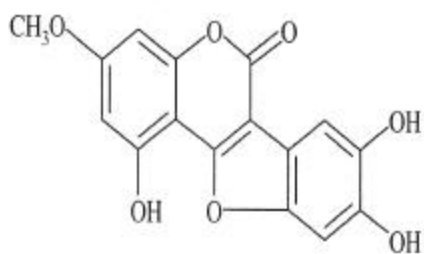
Whole plant of *Eclipta alba* contain ecliptal [a terthienyl aldehyde], 2-angeloyloxy methylene-5^l-[but-3-en-1-ynyl] dithiophene, 5-isovaleryloxy methylene-2-(4-isovaleryloxy-but-3-ynyl) dithiophene¹³, isoflavonoids wedelolactone, desmethylwedelolactone, 7-0-glucoside¹⁰.

Wagner, polypeptides isolated from the plant yielded cystine, glutamic acid, phenylalanine, tyrosine and methionine on hydrolysis⁷. The whole plant also contain nicotine, alkaloid and stigmasterol²¹.

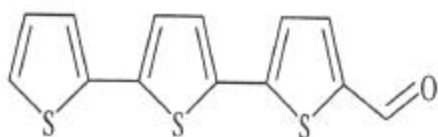
Zhang and Chen, Zhang have been reported several saponins in the plant viz; eclalbosaponins have been characterized²²⁻²³. Ecliptasaponin C was deduced as 3- β -0-D-glucopyranosyl-19- β -hydroxy olean-12-ene-28-oic acid 28-0- β -D-glucopyranoside. Ecliptasaponin D was deduced as 3- β , 16- β -dihydroxy olean-12-ene-28-oic acid-3- β -0-D-glucopyranoside.

Upadhyay, isolated from the whole plant, a triterpene saponin, named eclalbatin together with α -amyrin, ursolic acid and oleanolic acid. Eclalbatin was characterized as 3-0- β -D-glucopyranosyl-3-olean-12-en-28-oic acid, 28-0- β -D-arabinopyranoside²⁴.

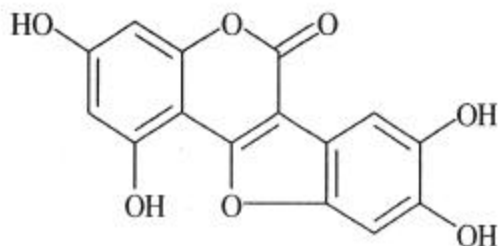
Bioassay guided fractionation of the methanolic extract of *Eclipta alba* using yeast strains resulted in the isolation of six new steroidal alkaloids. Abdel Kader were identified new alkaloids as 20-epi-3-dehydroxy-3-oxo-5,6-dihydro-4,5-dehydroverazine, ecliptalbine [(20R)-20-pyridyl-cholesta-5-ene-3- β -23-diol], (20R)-4- β -hydroxyverazine, 4- β -hydroxyverazine, (20R)-25- β -hydroxyverazine and 25- β -hydroxyverazine²⁵.



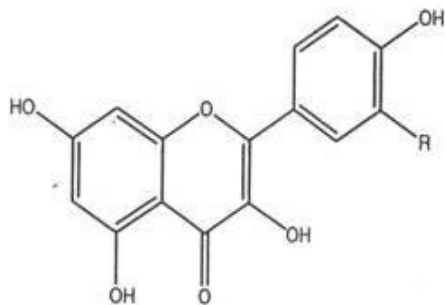
Wedelolactone



Ecliptal



Demethylwedelolactone



Apigenin, R=H
Luteolin, R=OH

Pharmacological / Biological Activities

1. Hepatoprotective Activity

There have been an extensive studies carried out to substantiate the hepatoprotective activity of *Eclipta alba*. Alcoholic extract of the plant is known to show protective effect on experimental liver damage in rats and mice²⁶. The plant has been reported to exhibit hepatoprotective action on subcellular levels of functional markers²⁷, in inflammation and liver injury²⁸. The ethanol / H₂O [1:1] extract of

Eclipta alba significantly counteracted CCl₄ induced inhibition of the hepatic microsomal drug metabolizing enzyme amidopyrine N-demethylase and membrane bound glucose 6- phosphatase. The loss of hepatic lysosomal acid phosphatase and alkaline phosphatase was significantly restored by the extract. The plant is reported to exhibit protective effect on carbon tetrachloride induced acute liver damage, by reducing centrilobular necrosis, hydropic degeneration and fatty change of the hepatic parenchymal cells²⁹. The ethyl acetate fraction showed improved and effective protection in doses of 20, 40 and 80 mg/kg in rats³⁰.

Wagner et al [1986] confirmed that the coumestan constituents of the plant wedelolactone and demethylwedelolactone are responsible for the potent antihepatotoxic activities in carbon tetrachloride, galactosamine and phalloidin induced liver damage in rats⁷.

Wedelolactone has been reported to be a potent and selective 5-lipoxygenase inhibitor with an IC₅₀ of 2.5 μM and it doses so by an oxygen radical scavenging mechanism³¹.

2. C. N. S. Activity

Studies indicated that the aqueous extract of *Eclipta alba* and its hydrolyzed fraction at a dose of 300 mg/kg and 300 mg/kg p.o. respectively showed nootropic activity in rats³².

3. Antimicrobial Activity

Studies revealed the antihepatitis B virus properties of *Eclipta alba*³³. The shoot extract showed antibacterial activity against staphylococcus aureus and Eclipta Coli⁸.

4. Antinociceptive Activity

An alcoholic extract of the plant showed antinociceptive effect in a dose of 200 mg/kg in rats due to the coumarin compounds³⁴.

5. Antiinflammatory and Analgesic Activity

The plant has been reported to possess anti-inflammatory and bronchodilator activities, due to the coumarin compounds³⁵. Further studies reported confirmed analgesic activity of *Eclipta alba*³⁶.

6. Immunomodulatory Activity

Preliminary studies revealed the immunomodulatory activity of methanolic extract of *Eclipta alba*³⁷. Wedelolactone and demethylwedelolactone isolated from *Eclipta alba* exhibited trypsin inhibition in vitro. Both compounds showed potent activity with IC₅₀ values of 2.9 and 3.0 μg/ml, respectively³⁸.

7. Antiviral Activity

The alcoholic extract has shown antiviral activity against Ranikhet disease³⁹.

8. Hair Growth Activity

Roy et al have been reported quantitative analysis of hair growth after treatment with petroleum ether extract [5 %] exhibited greater number of hair follicles in anagenic phase [69 ± 4] which were higher as compared to control [47 ± 13]. Treatment with 2% and 5 % petroleum ether extracts were better than the positive control minoxidil 2% treatment⁵¹.

9. Miscellaneous Activity

Further, Trāsina, an Ayurvedic herbal formulation comprising of Withania somnifera, Tinospora cordifolia, *Eclipta alba*, Ocimum sanctum, Picrorrhiza kurroa and Shilajit induced a dose related decrease in STZ hyperglycemia and attenuation of STZ induced decrease in islet SOD activity⁴⁰.

It has also been reported that in alloxan induced diabetic rats the oral

administration of the leaf suspension of *Eclipta alba* in a dose of 2 and 4 gm/kg resulted in significant reduction in blood glucose, glycosylated hemoglobin, and an increase in the activity of liver hexokinase⁴¹.

Further, studies have revealed that the aqueous extract of *Eclipta alba* and its hydrolyzed fraction at a dose of 300mg/kg and 30 mg/kg p.o; respectively provided protection against cold restraint induced gastric ulcer formation in rats³².

Ethanol extract of leaves *Eclipta alba* has been evaluated for its wound healing activity in either anaesthetized wistar rats at two different doses [150 and 300 mg/kg] using incision, excision and dead space wound model. Enhanced wound healing activity may be due to free radical scavenging action of the plant and the enhanced level of antioxidant enzymes in granuloma tissue⁴².

The plant also exhibited anticatarrhal, deobstruent, spasmogenic, Hypotensive properties. The juice of fresh leaves mixed with neem oil, applied locally, promotes hair growth; the herbs extract boiled with coconut oil promotes hair growth and the black pigment of the herb makes grey hair black. The water extract of the plant at absolute concentration tested on *sitotroga cerebella ova* recorded strong ovicidal property⁸.

Ayurvedic Properties and Action

Rasa - Katu, Tikta
 Guna - Ruksa, Tiksna
 Virya - Usna
 Vipaka - Katu
 Doshagnata - Kaphavatashamaka
 Rogagnata - Shleepada, Granthi, Vrana, Kshala, Netraroga, Palitya, Kesharoga, Bhrama, Naktandhya, Kamala, Arsha, Ajeerna, Kushtha, Kilasa, Jwara, Kasa, Pandu, Shotha, Shwasa, Daurbaya, Charmaroga.
 Karma - Vatahara, Kaphahara, Amahara, Balya, Rasayana, Kesya, Tvacya, Dantya, Caksusya, Visahara^{10,43}.

भृङ्गारः कटुकस्तिक्तो रुक्षोष्णः कफघ्नानुत्
 केश्यस्त्वच्य कृमिघ्नासकासशोधाम पाण्डुनुत्॥
 (भा.प्र.)

*Bhr̥ṅgāraḥ kaṭukastiktorūkṣoṣṇaḥ kaphavātanūt
 Keśyastvacyaḥ kṛmīśvāsakāsaśoṣtham
 pāṇḍunūt. (Bhāvaprakāṣa)*

Classical Use

Bhringaraja powder 1 part, black sesamum seeds half part, Aamalaka (*Emblica officinale*) half part, classically know as Bhringaraja churna, was prescribed as a rejuvenating and age-sustaining tonic.

Bhringaraja was also used as a detoxifying deobstruent and antiseptic herb in vitiated blood, anaemia, splenic and liver enlargements, catarrhal jaundice, hyperacidity, gastritis, dysentery⁸, nightblindness, eye diseases¹², toothache⁹, laxative⁴³.

The juice of *Eclipta alba* was used for washing wounds and soft chancre (*Gadanigraha*). The powder of the root and Haridraa (*Curcuma longa*) was applied locally on skin affections.

The oil extract of leaves was prescribed by charaka and sushruta for anointing the head, for hair growth and for giving natural colour to grey hair. Neelibhringaadi Tailam (*Sahasrayoga*) is prescribed for promoting hair growth and for giving natural colour to grey hair.

In Unani medicine the juice of leaves is prescribed in skin diseases, cough, rheumatism, bronchitis, allergic urticaria, inflatulence, colic and liver affections. The seeds are used in sexual debility and aphrodisiac. Externally the paste of leaves is applied over swellings⁸. The root is used as an emetic and purgative¹⁰.

Use in Western Herbal

The herb was first mentioned in the Chinese Tang Medica of 6⁵⁹AD. A decoction is used to invigorate the liver, greying of hair, staunch bleeding, spermatorrhoea, menorrhagia.

In the Caribbean, the juice is taken for asthma, bronchitis; dizziness, vertigo, blurred vision, skin problems⁸.

Toxicity Studies

In studies the conducted the alcoholic extract of *Eclipta alba* shows no signs of toxicity in rats and mice; and the minimum lethal dose was found to be greater than 2.0 gm/kg when given orally and intraperitonially in mice²⁶.

Clinical Studies

The herbal drug Tefroli, containing extracts of the plant in combination with others, when administered to the patients of viral hepatitis, produced improvement and good results⁴⁶.

There has been clinical studies conducted that prove the effectiveness of *Eclipta alba* therapy in jaundice in children⁴⁷, and Bhringaraja Ghanasatwavi on the patients of kosthashakhasrits kamala with special reference to hepatocellular jaundice⁴⁸.

Formulations and Preparations

Bhringaraja ghrita, Bhringaraja taila, Bringarajadi churna, Bringarajadya ghrita, Mahavatavidhwansana rasa, Shadabindu taila, Nilikadya taila, Nilabringadi taila, Ashwakunchaki rasa, Anandabhairava rasa, Sutashekharasava⁴⁵, Bhringarajasava, Tekaraja marica⁴⁴.

Suggested Combinations

1. Grahani Mihira Taila : Contains 12 gm drug/ 4 litres of taila. Recommended in case of fevers, acidity problems and respiratory problems.
2. Nilakadya Taila : Contains 12 gm drug/ 3 litres of taila. Used for abhyanga.
3. Nilibringadi Taila : Contains Bhringaraja svarasa – 768 ml/ 6.5 litres of taila. Used externally for sirobhyanga.

Dosage

1. 3-6 ml of the drug in juice form.
2. 12-36 gm of the drug in powder form for decoction⁴⁴.

Therapeutic Category

Hepatoprotective⁴⁹⁻⁵⁰.

Safety Aspects

The drug is traditionally considered to be safe in the dosage mentioned⁵².

Conclusion

Eclipta alba is quick-growing and popular herb. It is a traditionally important medicinal plant.

- *Eclipta alba* produce antiviral, antibacterial, spasmogenic, hypotensive, ovicidal, antileprotic, analgesic, antioxidant, antimyotoxic, antihemorrhagic, anticancer, hepatoprotective, antihepatotoxic.
- *Eclipta alba* is promoter for blackening and growth of

hair.

- Active constituent isolated from plant of *Eclipta alba*, wedelolactone and demethylwedelolactone are responsible for the potent antihepatotoxic activities in carbon tetrachloride, galactosamine and phalloidin induced liver damage in rats.
- *Eclipta alba* rich of chemical constituent which have therapeutic and medicinal value like wedelolactone, demethylwedelolactone, ecliptal, eclalbosaponins I-IV, hentriacontanol, 14-hepatocosanol, luteolin-7-O-glucoside, alkaloids and polypeptides.

The detail research on clinical study of plant extract as well as Ayurvedic / herbal formulation required.

References

- Rao, E. V., The Eastern Pharmacist, 5: 2000, 35-38.
- Sagrawat, H., Mann, A. S. and Kharya, M. D., Pharmacological potential of *Eugenia jambolana* : A review, Pharmacognosy Magazine, 2 (6): 2006, 96-105.
- Sharma, P. C., Yelne, M. B. and Denn's, T. J., Database on medicinal plants used in Ayurveda, Vol-2, (Central council for research in Ayurveda and Siddha, New Delhi, 2001), 112.
- The Ayurvedic Pharmacopoeia of India, Part-I, 1st Edition, Vol-II, (The controller of publications civil lines, Delhi), 21-22.
- Indian Herbal Pharmacopoeia, Vol-I, (A joint publication of regional research lab, Jammu-Tavi, 1998), 81-85.
- Pulak, M., Quality control of herbal drug; 1st Edition; (Horizan publishing, 2002), 303-305.
- Wagner, H., Geyer, B., Kiso, Y., Hikino, H. and Rao, G. S., Coumestans as the main active principles of the liver drugs *Eclipta alba* and *Wedelia calendulaceae*, *Planta Med*, 52: 1986, 370-374.
- Khare, C. P., Encyclopedia of Indian Medicinal Plants, (Springer-verlag Berlin Heidelberg, New York, 2004), 197-198.
- Kapoor, L. D., Handbook of Ayurvedic Medicinal Plants, (CRC Press LLC, 2001), 169.
- Williamson, E. M., Major Herbs Of Ayurveda, (Churchill Livingstone, China, 2002), 126-128.
- Sharma, P. C., Yelne, M. B., and Denn's, T. J., Database on Medicinal Plants Used in Ayurveda, Vol-2, (Central council for research in Ayurveda and Siddha, New Delhi, 2001), 114.
- Joshi, S. G., Medicinal Plants, (Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi, 2004), 81.
- Daniel, M., Medicinal Plants, (Chemistry and Properties, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi, 2006), 148-149.
- Singh, P., Naturally occurring thiophene derivatives from *Eclipta* species, *Bioact Mol*, 7: 1988, 179-186.
- Singh, P. and Bhargava, S., A dithienylacetylene ester from *Eclipta erecta*, *Phytochemistry*, 31: 1992, 2883-2884.
- Jain, S. and Singh, P., A dithienylacetylene ester from *Eclipta erecta* Linn, *Indian J. Chem.*, 27 B: 1988, 99-100.
- Sikroria, B. C., Srivastava, S. J., and Niranjana, G. S., Phytochemical studies on *Eclipta alba*, *J. Indian Chem. Soc.*, 59: 1982, 905-909.
- Mehra, P. N. and Handa, S. S., Pharmacognosy of Bhringaraja antihepatotoxic drug Of Indian origin, *Indian J. Pharm*, 30: 1968, 284.
- Bohlmann, F. and Zdero, C., Polyacetylene compounds, Part 173, Constituents of *Eclipta erecta*. *Chem. Ber.*, 103 : 1970, 834-841.
- Sarg, T. M. and Khafagi, S. M., The steroid, triterpenoid and flavonoid constituents of *Eclipta alba* (L.) Hassk. *Sci. Pharm.*, 49 : 1981, 262-264.
- Pal, S. N., and Narasimhan, N., The alkaloid in *Eclipta alba* [Hassk], *J. Indian Chem Soc.*, 20 : 1943, 181-186.
- Zhang, M. and Chen, Y. Y., Isolation and identification of ecliptasaponin A and ecliptasaponin B from *Eclipta alba* [L.] Hassk. *Yao Hseueh Hsueh Pao*, 31 : 1996, 196-199.
- Zhang, M., Chen, Y. Y., Di, X. H. and Liu, M., Isolation and identification of ecliptasaponin D from *Eclipta alba* [L.] Hassk. *Yao Hseueh Hsueh Pao*, 32 : 1997, 633-634.
- Upadhyay, R.K., Pandey, M. B., Jha, R. N. and Pandey, V. B., Eclalbatin, a triterpene saponin from *Eclipta alba*, *J. Asian Nat Prod. Res.*, 3 : 2001, 213-217.
- Abdel K. M. S., Bahler, B. D., Malone, S., Werkhoven, M. C., Van, T. F., David, W. J. H. and Bursuker, I., DNA-damaging steroidal alkaloids from *Eclipta alba* from the suriname rain forest, *J. Nat. Prod*, 61 : 1998, 1202-1208.
- Singh, B., Saxena, K., Chandan, B., Agarwal, S., Bhatia, M. and Anand, K., Hepatoprotective effect of ethanolic extract of *Eclipta alba* on Experimental liver damage in rats and mice, *Phytother. Res.*, 7 (2) : 1993, 154-158.
- Saxena, A. K., Singh, B. and Anand, K. K., Hepatoprotective effects of *Eclipta alba* on subcellular levels in rats, *J. Ethnopharmacol*, 40 : 1993, 155-161.
- Chandra, T., Sadique, J. and Somasundaram, S., Effect of *Eclipta alba* on inflammatory and liver injury, *Fitoterapia*, 58 : 1987, 23-32.
- Khin, M. M., Nyunt, N. and Khin, M. T., The protective effect of *Eclipta alba* on carbon tetrachloride induced acute liver damage, *Toxicol. Appl. Pharmacol*, 45 : 1978, 723-728.
- Singh, B., Saxena, A. K., Chandan, B. K., Agarwal, G. and Anand, K. K., In vivo hepatoprotective activity of active fraction from ethanolic extract of *Eclipta alba*, *Indian J. Physio. Pharmacol*, 45 : 2001, 435-441.
- Wagner, H. and Fessler, B., In vitro-5-Lipoxygenase inhibition by *Eclipta alba* extracts and the coumestan derivative wadelolactone, *Planta Med.*, 52 : 1986, 374-377.
- Thakur, V. D. and Mengi, S. A., Neuropharmacological profile of *Eclipta alba* [L.] Hassk, *J. Ethnopharmacol*, 102 : 2005, 23-31.
- Jayaram, S., Thyagrajan, S., Panchanadam, M. and Subramanian, S., Anti-hepatitis B virus properties of *Phyllanthus niruri* Linn and *Eclipta alba* Hassk : in vitro and in vivo safety studies, *Bio-Medicine*, 7 : 1987, 9-16.
- Pandey, P. S., Pandey, K. K., Upadhyay, O. P. and Pandey, D. N., Experimental evaluation of the analgesic property of *Eclipta alba* [L] Hassk, *Ancient Science of life*, 17 : 1997, 36-40.
- Leal, L. K., Ferreira, A. A., Bezerra, G. A., Matos, F. J., and Viana, G. S., Antinociceptive, anti-inflammatory and bronchodilator activities of Brazilian medicinal plants containing coumarin, a comparative study, *J. Ethnopharmacol*, 2 : 2000, 51-59.
- Sawant, M., Jolly, I. and Shridhar, N., Analgesic studies on total alkaloids and alcohol extracts of *Eclipta alba* [L.] Hassk, *Phytotherapy Research*, 18 : 2004, 111-113.
- Jayathirtha, M. G. and Mishra, S. H., Preliminary immunomodulatory activities of methanolic extracts of *Eclipta alba* and *Centella asiatica*, *Phytomedicine*, 11: 2004, 361-365.
- Syed, S. D., Muddarachappa, K. A., D'souza, P., Agarwal, A. and Venkataraman, B. V., Trypsin inhibitory effect of wedelolactone and demethylwedelolactone, *Phytother. Res.* 17 : 2003, 420-421.
- Dhar, M. L., Dhar, M. M., Dhavan, B. N., Mehrotra, B. N., Roy, C., Screening of Indian plants for biological activity, *Indian J. Exp. Biol*, 6 : 1968, 232.
- Bhattacharya, S. K., Kalkunte, S. S. and Ghosal, S., Antioxidant activity of glywithanolides from *Withania somnifera*, *Indian J. Exp. Biol*, 35 : 1997, 236-239.
- Ananthi, J., Prakasam, A., and Pugalendi, K. V., Antihyperglycemic activity of *Eclipta alba* leaf on alloxan induced diabetic rats, *Yale J. Biol. Med.*, 76 : 2003, 97-102.
- Sharma, S. and Sikarwar, M. S., Wound healing activity of ethanolic

- extract of leaves of *Eclipta alba*, *Pharmacognosy Magazine*, 4 (13) : 2008, 108-111.
43. Nadkarni, K. M. and .Nadkarni, A. K., *Indian Materia Medica*, Vol-I, (Bombay popular prakashan, Bombay, 1994), 471-472.
 44. *The Ayurvedic Pharmacopoeia of India*, Part-I, 1st edition ,Vol-II, (The controller of publications civil lines, Delhi), 24.
 45. Sharma, P. C., Yelne, M. B. and Denn's,T. J., *Database on Medicinal plants used in Ayurveda*, Vol-2, (Central council for research in Ayurveda and Siddna, New Delhi, 2001), 115.
 46. Sankaran, J., An all India muticentric clinical survey on a herbal cure-tefroli for hepatitis, *J. Natl. Integ. Med. Ass.*, 26 :1984, 255-261.
 47. Dixit, S. P. and Achar, M. P., Study of Bringaraj [*Eclipta alba*] therapy in jaundice in children, *J. Sci. Res., Pl. Med.*, 2 : 1981,96-100.
 48. Anon, A trial of Bhringaraja Ghanasatwavati on the patients of kostha-shakharita kamala [with special reference to hepatocellular jaundice], *J. Natl. Integ. Med. Ass.*, 24 : 1982, 265-269.
 49. Sharma, A. K., Pushpangadan, P., Chandan,B. K., Chopra, C. L., Prabhakar, Y. S. and Damodaran, N. P., Hepatoprotective effects of *Wedelia calendulacea*, *J. Ethnopharmacol*, 25 : 1989, 93-102.
 50. Gopalkrishnan, S., Sadique, J., Chandra, T., Antihepatotoxic activity of *Wedelia calendulacea* in rats, *Fitoterapia*, 60 :1989, 456-459.
 51. Roy, R. K., Thakur, M. and Dixit,V. K., Hair growth promoting activity of *Eclipta alba* in male albino rats, *Arch Dermatol Res*, 300 : 2008, 357-364.
 52. Gupta, A. K., *Quality standards of Indian Medicinal Plants*, Vol-1, (Published by Indian council of Medical Research , New Delhi, 2003), 226-233.

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