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REVIEW ARTICLE

Pharmacological Properties of *Bhringaraj* (Eclipta alba Hassk.)

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ABSTRACT

Bhringaraj (*Eclipta alba* Hassk.) is well known drug of *Ayurveda* since ancient time for its multidimensional properties and uses in many diseased conditions. All texts of *Ayurveda* mentioned its uses in conditions like Cough, Asthama, Vitiligo, greying of hairs, eye diseases, night blindness, abortion, sinus, scrofula and wound, gastritis, soft chancre, headache, vaginal pain and dysentery. Modern studies also proved its properties like hair growth promoting activity, Hepatoprotective activity, Antidiabetic activity, Analgesic and Anti-Inflammatory Activities, Neuropharmacological Activities, Antioxidant activity, Antieczema activity, Antimicrobial Activity against different bacteria, Antimalarial Activity, diuretic activity, reduces blood pressure and chlesterol, Immunomodulatory activity, Antiepilepsy activity, Antisnake venom activity, Anticancer activity, Antiulcer Activity and Anthelmintic Activity.

Key Words *Eclipta alba, Hepatoprotective, Anti-cancer, Alkaloids, Immunomodulator*

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INTRODUCTION

Bhringaraj is well known drug of *Ayurveda*, having Bootanical name as *Eclipta alba* (L.) Hassk. Syn. *Eclipta prostrata* (L.) L. belongs to Asteraceae family. The plant is bitter(*tikta*), acrid, thermogenic(*ushna*), alterative, anti-inflammatory(*shothahara*), anthelmintic(*krimighna*), anodyne, vulnerary, ophthalmic, digestive(*deepan*), carminative, emetic, haematinic, diuretic(*mutral*), aphrodisiac(*vajikaran*), hair tonic(*keshya*), deobstruent, absorbent, depurative, tonic(*balya*) and febrifuge(j*waraghna*). It is useful in hepato-splenomegaly(*yakrit-pleehavriddhi*) and its associated disorders, elephantiasis, inflammations(*shotha*), gastric disorders, anorexia(*aruchi*), worm infestation(*krimi*), skin diseases(*twaka vikara*), wounds(*varna*), ulcers, ophthalmic disorders(*netrarog*), headache(*shirashool*), hypertension, strangury, leprosy, pruritus, fever (*jwara*), jaundice(*kamala*), toothache (*dantashool*), earache(*karnashool*). It is good for colouring and strong hairs and stopping haemorrhages and fluxes and for gums strengthening. Seeds are used for aphrodisiac action[1.] Official useful part of Bhringaraj is whole plant and seeds with dose 3-6ml in juice form and 12-36gm in powder form

for decoction[2]. Present study was aim to compile the pharmacological activity related studies of *Bhringaraj* and compare it with *Ayurvedic* properties and *karma*(action) given in *Samhitas* and *Nighantus*

MATERIALS AND METHODS

All *Samhitas*, commentaries and *Nighantus* were searched for Ayurvedic literature. Contemporary information was collected from modern books, journals and internet. All information was studied, analyzed and interpreted.

RESULTS & DISCUSSION

Bhringaraj is having synonyms as *Markava*, *Keshraja*, *Keshranjana*, *Bhringa*, *Angaraka*, *Bhringara*. Attributes of *Bhringaraja* are *Rasa*(taste) – *Katu*(pungent), *Tikta*(bitter), *Guna*(physical properties) – *Ruksha*(dry), *Laghu*((lightness), *Veerya*(potency) – *Ushna*(hot), *Veepaka*(post digestive effect) – *Katu*(pungent), *Doshaghnata*(action on dosha) – *Kaphavatashamaka*(pacifying *Kapha* and *Vata*). Three types of *Bhringaraj* have been mentioned by *Pandit Narhari* in *Raj nighantu*. In *nighnatus* pharmacological actions of *Bhringaraj* are mentioned as *Keshya*(hair growth promoting), *Rasayana*(rejuvenating drug), *Chakshushya*(beneficial for eye), *Vishahara*(antitoxic), *Shothahara*(anti-inflammatory), *Twachya*(useful in skin diseases), *Dantya*(useful in Dental disoreders), *Balya*(general tonic), *Vedanasthapan*(pain killer), *Vranashodhan* (wound cleaning), *YakrutUttejaka*(hepatotonic), *Deepan*(appetizer), *Pachana*(digestive), *Virechana*(laxative), *Medhya*(brain tonic). Indications of *Bhringaraja* are given as *Kasa*(cough), *Krimi*(verms), *Shwasa*(Asthama), *Kushtha*(skin diseases), *Yakshma*(Tuberculosis), *Pandu*(Anemia), *Raktapitta*(Epistaxis), *Amlapitta*(Acidity), *Shiroroga*(Head disorders), *Jwara*(fever), *Nadivrana*(sinus), *Swarabheda*((hoarseness of voice), *Hridroga*(heart diseases)[3].

Bhringaraja-taila is used in Bronchial asthma and cough (SS.U.51.30). Juice of *Kasamarda*, horses's faeces, *Bhringaraja*, *Vartak* and *Tulasi* (black) mixed with honey alleviate cough caused by kapha. (CS.Ci.18.117). Oil cooked with *Bhringaraja* juice twenty parts along with the paste of *Haritaki* alleviates bronchial asthma and cough immediately as does *Triphala* decoction mixed with ghee (KK.16.11). One suffering from Vitiligo should take *Bhringaraja* fried in oil and kept in an iron vessel followed by intake of milk cooked with *Bijaka*.(AH.Ci.20.8). Oil 160 ml, is cooked with the juice of *Bhringaraja* and milk 1.28 litres along with the paste of *Madhuka* 40 gm. This, used as snuff, alleviates greying of hairs. (CS.Ci.26.267). Flowers of *Bhringaraja* and *Japa* pounded with sheep milk and dissolved in the same is put in an earthen vessel and kept underground for a week. Then it is taken out and mixed with *Bhringaraja* juice is anointed on the head which is covered for the whole night. In morning it is washed. Thus the hairs are blackened. (CD.55.120-21). Powder made of *Bhringaraja* root and *Haridra* is applied locally

in *Varahadamsha*. It alleviates the disease. (BP.Ci.61.113). For improving eye sight *Bhringaraja taila*. (VM.61.211), *Tila* oil and *Vibhitaka* oil cooked with *Bhringaraja* juice and decoction of asana in an iron vessel is used as snuff. It improves eye sight. (AH.U.13.46). Intake of fish eggs cooked with *Bhringaraja* removes night blindness in a week. During the course, the patient should keep on wholesome diet. (CD.59.172). To stabilize foetus pregnant woman should take cow milk with same amount of *Bhringaraja* juice. Thus she is protected from abortion. (VD.13.20). Those who take the juice of *Bhringaraja* daily for a month keeping on milk diet become full of strength and vigour and attain the life-span of hundred years. (AH.U.39.163; also 39.175). One who takes leaves of *Bhringaraja* combined with black Sesamum for a month keeping on milk-diet lives long, healthy and with black hairs (VM.69.9). Intake of powder of *Bhringaraja* leaves, black sesamum, *Aavala* and sugar in same quantity acts as *Rasayana*. Oil cooked with *Bhringaraja* juice alleviates sinus caused by *Kapha* and *vata*, scrofula and wounds (SS.Ci.17.38). Powder of *Haritaki* and *Bhringaraja* mixed with old jaggery controls vomiting caused by hyperacidity in acid gastritis (CD.52.12). Washing the wound with the juice of *Bhringaraja* eliminates this soft chancre of venereal disease (GN.4.8.13). *Bhringaraja* juice mixed with same amount of goat's milk and heated in the sun is used as snuff. It is an excellent remedy of *Suryavartta* (a type of headache) (BP.Ci.62.50). Root paste of *Bilva* and *Bhringaraja* should be taken with wine. It relieves pain in vagina (BS.striroga.249). Pill made of *Bhringaraja* with water alleviates dysentery with mucus, blood and griping. (BS.atisara.120)[4].

Active principles present in *Bhringaraj* are coumestans, alkaloids, flavonoids, glycosides, polyacetylenes, triterpenoids. The leaves are having stigmasterol, β-terthienylmethanol, wedelolactone, demethylwedelolactone and demethylwedelolactone-7-glucoside. The roots contains hentriacontanol and heptacosanol, polyacetylene substituted thiophenes. The aerial part is having a phytosterol, β-amyrin in the n-hexane extract and luteolin-7-glucoside, βglucoside of phytosterol, a glucoside of a triterpenic acid and wedelolactone in polar solvent extract. The polypeptides isolated from the plant gives cystine, glutamic acid, phenyl alanine, tyrosine and methionine after hydrolization. Nicotine and nicotinic acid are also reported [5].

Pharmacological Activities Reported-

1. *Keshya Karma* (Hair Growth Promoting Activity)

A study was conducted by Roy R.K et.al. to test the *Keshya Karma* of petroleum ether and ethanol extract of E.alba in albino rats. Oleaginous cream(cream base used was water in oil) was prepared from extracts and local application was done on shaved skin of male albino rats. Group treated by cream showed significant reduction in hair growth time by 50% as compared with non treated group. Quantitative analysis showed more

number of hair follicles in Anagenic phase in Petroleum ether extract(5%) treated group as compared to control group(non treated group)[6].

Another study was done to test *Keshya Karma* of Methenolic extract of E.alba and animals used were pigmented C57/BL6 mice. Topical application of extract was done and telogen to anagen transmission was assessed. A dose dependent transition phase of hair growth frm telogen to anagen was observed after treatment. At dose of 3.2 mg/15 cm^2, 87.5% animals showed anagen phase of growth, while at dose of 1.6 mg/15 cm^2, half population showed the transition from telogen to anagen phase[7] .

In another study a formulation containing *Bhringaraj* (E. alba), *Japa* (Hibiscus rosa-sinensis), and *Jatamansi* (Nardostachys jatamansi) showed *Keshya karma.* Animals used were Wistar albino rats. Hair growth initiation time and time required for complete hair growth were reduced significantly. Treatment with the formulation showed more number of hair follicles in the anagenic phase[8].

2. Hepatoprotective Activity

A study was done to test hepatoprotective effect of *Bhringaraj* against carbon tetrachloride induced liver damage[9]. Coumestans (wedelolactone and demethyl wedelolactone) was possible constituent for hepatoprotective effect; both compounds showed hepatoprotective activity in study done with CCl4—(carbon tetrachloride), GalN—(galactosamine), and phalloidin-cytotoxicity in rat hepatocytes, liver cell regeneration get stimulated significantly[10]. Alcoholic extract of E. alba possesses hepatoprotective activity by CCl4-induced liver damage. In CCl4-administered rats, there was an increase in liver weight, pentobarbitone sleep time, and elevated SGOT, SGPT, SALP, and serum bilirubin levels. The alcoholic extract at a dose of 200 mg/kg significantly reversed these effects[11].

3. Antidiabetic Activity

An Ayurvedic formulation containing *Ashwagandha* (Withania somnifera), *Guduchi* (Tinospora cordifolia), *Bhringaraj* (Eclipta alba), *Tulasi* (Ocimum sanctum), *Kutaki* (Picrorhiza kurroa) and shilajit was tested for antidiabetic activity at 100mg/kg and 200mg/kg oral dose for 28 days in streptozotocin- (STZ-) induced diabetes in male CF strain rats. Formulation induced a dose related decrease in STZ hyperglycemia and attenuation of STZ induced decrease in pancreatic islet superoxide dismutase (SOD) activity, the STZ-induced hyperglycemia was the consequence of decreased islet SOD in islets[12].

4.*Vedanashaman* and *Shothahara karma* (Analgesic and Anti-Inflammatory Activities)

A study was conducted to asses' *Vedanashamana* activity of Ethanolic extract of *Bhringaraja*. Tail flick, hot plate and writhing method were used. At dose of 200mg/kg E.alba alcoholic extract showed significant analgesic and antinociceptive effect[13].

Another study was done by Leal L et.al. for the assessment of antinociceptive activity of Hydro-alcoholic extract of the E.alba by acetic acid-

induced writhing tests in rodent model. At a dose of 200 mg/kg orally, the extract showed analgesic effects in formalin tests, with the inhibition occurring in the last of the response[14].

5. *Twaka vikara* (Skin Diseases)

A study done by Kaur M and Chandola H.M. on Bhringaraj churna powder showed significant result in patients of "Vicharchika" (eczema)[15]. A study done by Chan C.et.al. on aqeous extract of Bhringaraj showed significant antioxidant and protective effect against ultraviolet- (UV-) irradiation-induced damage. The protective effect against skin cell damage was attributed to a synergistic effect between chlorogenic acid and other active components present in the extract[16].

6. Neuropharmacological Activities

A study conducted by Thakur V.D. and Mengi S.A. on aqueous and hydro-alcoholic extracts of Bhringaraj. The drug was tested for sedative, muscle relaxant, anxiolytic, nootropic, and antistress activities. Orally 150 and 300 mg/kg dose was given. The findings proved nootropic activity of the aqueous extract (300 mg/kg, p.o.) and its hydrolyzed fraction (30 mg/kg, p.o.)[17].

7.*Rasayana karma* (Antioxidant Activity)

A study done by Kaur G to assess *Rasayana* activity of methanol and hydrolyzed extract of E. alba both in vitro and ex vivo models. The in vitro antioxidant activity was assessed by 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging and nitric oxide radical inhibition activity. The ex vivo antioxidant activity was assessed by lipid peroxidation inhibitory activity on mice liver homogenate by thiobarbituric acid-reactive substances (TBARS) method. Both methanolic and hydrolyzed extract showed potent antioxidant activity in both models[18].

8. Antimicrobial Activity

Various solvent (petroleum ether, benzene, chloroform, acetone, methanol, and aqueous) extracts of E. alba were active against clinical isolates from oral cancer cases. These isolates included various bacteria like Staphylococcus aureus, Escherichia coli, Staphylococcus epidermis, Pseudomonas aeruginosa, Klebsiella pneumoniae, Proteus mirabilis, and Proteus vulgaris and funguses like Candida albicans and Aspergillus fumigates[19]. Ethanol and ethyl acetate extracts was active against E. coli, K. pneumoniae, Shigella dysenteriae, Salmonella typhi, P. aeruginosa, Bacillus subtilis, and S. aureus with Minimum Inhibitory Concentrations (MIC) ranging from 4.5 to 90 µL/mL[20].

9. Antimalarial Activity

A study was done by Saroj B. et.al. to assess antimalarial activity of leaf extract of *Bhringaraj*. The methanolic leaf extract at dose of 250–750 mg/kg showed a significant antimalerial activity. The plant extract also posses repository activity[21].

10. Cardiovascular Effects

A clinical study was conducted to asses the effect of E.alba leaf powder in mild hypertension. Capsules containing 500mg of leaf powder were prepared and given at 2 capsules TID for 60 days. The findings are suggestive of diuretic, hypotensive, and hypocholesterolemic properties

and helps in the alleviation of oxidative stress-induced complications in hypertension[22] .

11. Immunomodulatory Effects

A study was conducted by Jayatirtha M.G.and Mishra S.H. to prove the immunomodulatory responses of whole plant methanolic extract of of *Bhringaraj* (containing 1.6% wedelolactone) at dose ranging from 100 to 500 mg/kg body weight using carbon clearance, antibody titer, and cyclophosphamide immunosuppression parameters. Test drug significantly increased the phagocytic index and antibody titer. The F ratios of the phagocytic index and white blood cell (WBC) count were also significant[23].

12. Antiepilepsy Activity

A study was conducted by Mishra S. et.al.to assess anticonvulsant and muscle relaxant activity of ethenolic extract of leaf of E.alba at 50mg/kg, 100mg/kg, 200mg/kg and 400mg//kg dose orally on maximal electroshock-induced seizures (MES), rotarod, and traction test, respectively, in rats. At doses of 200 and 400 mg/kg, the extract reduced seizures induced by MES, decreased the duration of tonic hind limb extension (THLE) (by 76.2 and 89.8%, resp.), and decreased motor coordination showing anticonvulsant and muscle relaxant activity[24].

13. Snake Bite

Extract of E. alba has been shown to inhibit snake venom phospholipase A2 activity of Crotalus durissus terrificus venom. The inhibitory activity has been attributed to the coumestans, wedelolactone, and demethylwedelolactone, present in the extract[25].

14. Anticancer Activity

A study was conducted by Lee M. et.al. on methenolic extract of Bhringaraj to prove anticancer property on growth of colon cancer cells. The study showed inhibitory activity on the proliferation of hepatic stellate cells or HSCs. Activity-guided fractionation led to the isolation of five oleanane-type triterpenoids, echinocystic acid, eclalbasaponin II, eclalbasaponin V, eclalbasaponin I, and eclalbasaponin III, which are all echinocystic acid derivatives, among these, echinocystic acid and eclalbasaponin II significantly inhibited the proliferation of HSCs[26].

15. Antiulcer Activity

A study was done by Benarjee A. et.al on methenolic extract of *Bhringaraj* to prove antiulcer activity. Ulcers were induced in thirty-six-hour fasted Sprague Dawley rats by aspirin or ethanol or pylorus ligation plus aspirin treatment. The group treated with *Bhringaraj* prior to ulcer induction showed highly significant reduction in the occurrence of gastric ulcers as well as gastric inflammation (after 4 h of treatment) as compared to the control groups. The activity of test drug is like the activity of rabeprazole[27].

16. Anthelmintic Activity

A study was conducted to prove anthelmentic activity of E.alba using methanolic extract of whole plant, against the earthworm Pheretima posthuma at doses of 25–100 mg/mL. The extract exhibited paralysis of worms at doses of 50mg/ml, 75mg/ml, and 100 mg/mL and caused death of worms at 75mg/ml and 100 mg/mL[28].

The ethanol and aqueous extract also showed anthelmintic activity against P. posthuma[29].

Pharmacological activities of the chemical constituents of Eclipta alba[7]

Sr.No	Chemical constituents	Pharmacological activites
1	Wedelolactone	Antihepatotoxic, Antibacterial, Trypsin Inhibitor, Antivenom
2	Eclalbosaponins	hair revitalizing, Antiproleferative, Antigiardial
3	Demethylwedelolactone	Antihepatotoxic, Antihaemorrhage, Antivenom, Dye (cosmetic)
4	Dasyscyphin C	Antiviral,Anticancer
5	Eclalbatin	Antioxidant
6	Ecliptalbine, verazine	Lipid lowering, Analgesic

CONCLUSION

Bhringaraj is mentioned in all *Ayurvedic samhitas* and *Nighantus* in many diseased conditions. Its different pharmacological actions are due to the phytochemicals present in it, hair growth promoting activity is due to Eclalbosaponine, Hepatoprotective activity is due to Wedelolactone and Demethylwedelolactone, Antidiabetic activity, Analgesic and Anti-Inflammatory Activities is due to Ecliptalbine and verazine, Neuropharmacological Activities, Antioxidant activity is due to Eclalbatin, Antieczema activity, Antimicrobial Activity against different bacteria is due to Wedalolactone, Antimalarial Activity, diuretic, hypotensive, and hypocholesterolemic activity is due to Ecliptalbine and verazine , Immunomodulatory activity, Antiepilepsy activity, Antisnake venom activity is due to Wedalolactone, Anticancer activity is due to Dasyscyphin C which are proved either by Animal study by using different animal study models or by clinical study.

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