



A Review on Phytochemical and Pharmacological Profile of *Hedyotis corymbosa* Linn

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ABSTRACT

Hedyotis Corymbosa (Linn.) Lam (Rubiaceae), also known as Diamond flower occupies an important place in the history of Indian system of medicine. It is frequently found throughout India, Sri Lanka, Tropical East Asia to Java and Philippines. It is extensively used for treating viral infection, cancer, acne, hepatitis, eye diseases, skin ailments and bleeding. This plant is used to clear toxins and heat, thereby activate blood circulation and promote diuresis. It exhibits antibacterial, antioxidant, analgesic, hepatoprotective, anticancer and other activities. This present study depicts an overview on chemical constituents and Phytopharmacological profile of *Hedyotis corymbosa*.

Keywords: *Hedyotis Corymbosa*, Phytopharmacological profile, Phytochemical review, Rubiaceae.

INTRODUCTION

Plants represent the eternal kindness to nature by all means which is really expressed in varied human culture from time immemorable. Man's interest in plants began for his requirement of food and shelter. Next he sought among them remedies for injuries he received during his nomadic life. India have been known to be the rich repository of medicinal plants. The drugs are derived either from the whole plant or from different parts like leaves, stem, bark, root, flower and seed. Some drugs are prepared from excretory plant products such as gums, resins and latex. World Health Organization has shown great interest in documenting the use of medicinal plant used by tribes from different part of the world.¹

Hedyotis Linn is a genus of herbs and shrubs distributed in the tropical and subtropical region of the world. Around 70 species are found in India. Some of the important species includes;

Hedyotis auricularia Linn (Syn: *Oldenlandia auricularia*), *Hedyotis biflora* Linn (Syn: *Oldenlandia paniculata*), *Hedyotis corymbosa*(L). Lam (syn; *Oldenlandia coymbosa*), *Hedyotis costata* Roxb (Syn: *Hedyotis veestita* Roxb), *Hedyotis diffusa* (syn: *Oldenlandia diffusa*), *Hedyotis fruticosa* Linn (syn: *Oldenlandia fruticosa* K), *Hedyotis glabra*, *Hedyotis hispida* Retz , *Hedyotis herbacea* Linn (Syn: *Oldenlandia herbacea*), *Hedyotis umbellate* Linn (Syn: *Oldenlandia umbellate*) , *Hedyotis nitida*, *Hedyotis pinifolia*, *Hedyotis scandens* Roxb, and *Hedyotis stipulate*. The details of some *Hedyotis* species with their traditional uses and reported pharmacological actions are given in Table 1.²⁻⁹

Hedyotis Corymbosa

Hedyotis corymbosa(L). Lam (syn; *Oldenlandia coymbosa*), a flowering plant (Figure 1,2) in the family Rubiaceae, commonly called diamond flower is an annual, terrestrial,

dichotomous, slender ascending herb growing up to 50 cm. The leaves are 1.3 – 2 cm by 0.8 -3 mm, the lower leaves are often broader than upper ones, linear, acute, glabrous, usually with recurved margins. Flowers are white in pairs or in threes, usually on solitary axillary peduncles longer than the calyx. Fruits are loculicidal capsules, globose and the seeds are minute, pale brown, angular, testa tetriculate.¹⁰

TRADITIONAL IMPORTANCE OF HEDYOTIS CORYMBOSA

The plant is reported to have immunopotential activity and has been used in China to treat some tumors. An aqueous extract of the plant yielded a polysaccharide, composed of rhamnose, arabinose, xylose, mannose, galactose and glucose.¹¹

It is considered as a cooling medicine in the treatment of fever supposed to be caused by deranged air and bile and also treats remittent fever with gastric irritability and nervous depression.

In Konkan, the juice is applied to cool the burning sensation felt in the palms of the hand and soles of the feet. The juice is given internally with a little milk and sugar to cool the burning pit of the stomach. The decoction is given to cure remittent fever, heat eruptions and also applied to the surface of the body.

The plant extract treats liver diseases like jaundice and also used as an anthelmintic. The plant is used as a febrifuge throughout Indo China.¹²

Scientific Classification

Kingdom : Plantae
Division : Embryophytasiphongama
Sub Division : Angiospermae



Class	: Dicotyledonae	Bengal	: Khet-papra
Order	: Gentianales	Gujarat	: Parpat, khet-papra
Family	: Rubiaceae	Indo-China	: Coc man, Luo ran, Vocho
Genus	: Oldenlandia	Marathi	: Papti, Phapti, khet-papda, paripat
Species	: <i>Corymbosa</i>	Nepal	: Piriengo
Local Names of Plant		Kannada	: Parpatahullu, Kallasabatrasige
Sanskrit	: Parpata, parpataka, Kshetraparpata	Telugu	: Verrinella- vemu
English	: Flat top mille grains, Old World Diamond flower, Five leaved fumitory	Malayalam	: Parpatakapullu
Hindi	: Daman pappar, pitpapra	Tamil	: Parpatagam, kattucayaver, pappanpuntu

Table 1: Some *Hedyotis* species – traditional uses and reported pharmacological actions

Species	Synonym	Traditional uses	Reported Pharmacological actions		
			Part	Extract	Study
<i>Hedyotis diffusa</i>	<i>Oldenlandia diffusa</i>	The decoction is used for weakness, gonorrhoea, fever, impure blood.	Leaves	Methanol	Antitumor
<i>Hedyotis umbellata</i> Linn	<i>Oldenlandia umbellata</i>	The leaves and roots are considered as expectorant and used in asthma, bronchitis and consumption. The decoction of the leaves used as a wash for poisonous bites	Root	Methanol	Antibacterial
			Root	Ethanol	Anti inflammatory & Antipyretic
			Aerial	Methanol	Antioxidant, Hepatoprotective
<i>Hedyotis biflora</i> Linn	<i>Oldenlandia paniculata</i>	Used in Remittent fever, gastric irritation and nervous depression	Leaves	Petroleum ether, Ethyl acetate & water	Antibacterial
<i>Hedyotis herbacea</i> Linn	<i>Oldenlandia herbacea</i>	Powdered herb is administered with honey for rheumatic fever. Leaves are used as expectorant in asthma.	Whole plant	Ethanol	Anti inflammatory
				Petroleum ether, chloroform, ethyl acetate and methanol	Antioxidant

**Figure 1:** *Hedyotis corymbosa* Whole plant**Figure 2:** *Hedyotis corymbosa* Flower and Fruit

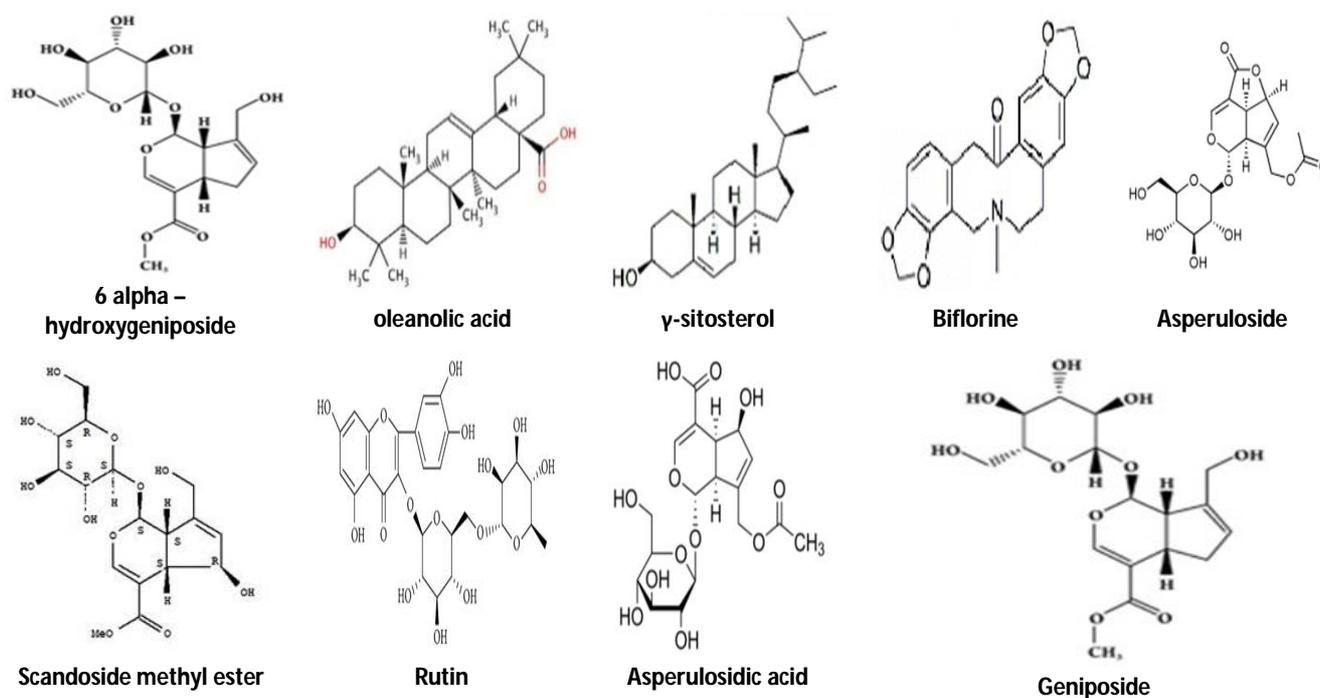


Figure 3: Chemical structures of some constituents of *Hedyotis corymbosa*

Chemical Constituents

Different phytochemical studies on *Hedyotis corymbosa* shows the presence of proteins, carbohydrates, phenols, tannins, flavanoids, saponins, steroids, terpenoids and glycosides. Some of the isolated compounds from whole plants are Geniposide, iridoid glycosides, 6 alpha – hydroxygeniposide, scandoside methyl ester (6 beta - hydroxygeniposide), 10-o-benzoylscandoside methyl ester, asperulosidic acid, asperuloside, deacteylasperuloside, 10-o-p-hydroxy benzoylscandoside methyl ester, rutin and (+)- lyoniresinol-3-alpha -o-beta glucopyranoside.¹³ The structures of some compounds are given in Figure 3.

Hedyotis corymbosa contains urosilic acid, oleanolic acid and gamma sitosterol. The air dried *Hedyotis corymbosa* contains 0.12% of alkaloids - bifloron (yellow crystalline powder, M.P 98^o), biflorin (White crystalline powder M.P 206^o), these two alkaloids are interconvertible. It also contains 13.55% of inorganic ash which is mainly responsible for its cooling effect.¹⁴

PHARMACOLOGICAL ACTIVITY

Anticancer

The ethanolic extract of leaves of *Hedyotis corymbosa* has shown significant anticancer activity on k562 human leukemia cell lines. The cell viability was measured by SRB (sulfurhodamine B) assay. The cell lines were grown under RPMI1640 medium containing 2 mL-glutamine, 10 % fetal bovine serum. The results was recorded on ELISA plate reader at 540 nm to 690 nm wavelength. The non toxic dose of *H.corymbosa* showed anticancer activity as compared to the standard drug adriamycin.¹⁵

The anticarcinogenic property of methanolic extract of the whole plant was studied by Microculture tetrazolium

salt (MTT) assay on the MCF-7 human breast carcinoma dependent hormone cell lines. The highest anticancer activity on MCF-7 cell line observed with IC 50 value of 22.67 μ g/ml. The anticancer activity of the plant extract is mainly due to its antioxidant activity.¹⁶

Hepatoprotectant

Hedyotis corymbosa showed significant hepatoprotective activity against Perchloroethylene, Carbon tetrachloride and D-Galactosamine induced liver damage in experimental animals.

Hepatoprotective action of ethanolic extract of *Hedyotis corymbosa* on perchloroethylene induced hepatic damage was studied in wistar albino female rats. The extract was administered orally at the dose of 400 mg/kg of body weight for ten days, showed significant reduction in liver marker enzymes (AST, ALT, LDH), lipid peroxidation and with significant increase in antioxidant enzyme levels. The results indicates *H.corymbosa* have potent hepatoprotective activity upon perchloroethylene induced hepatic damage in rats and also have anti lipidperoxidative and free radical scavenging activities.¹⁷

The hepatoprotective activity of ether, ethanol, butanol, butanone, petroleum ether and ethyl acetate extract fraction of *H.corymbosa* against CCl₄ induced hepatic damage was evaluated in albino rats (200-250g). Acute toxicity study was carried out in albino mice of either sex for determining LD 50 values for different extracts. The petroleum ether and ethyl acetate extract does not show any significant hepatoprotective activity. The elevated levels of SGPT and SGOT, were significantly decreased in ether and butanol extracts at P < 0.001 and in butanone and ethanol at p < 0.005. The enzymatic levels and histopathological studies showed that ether, butanol, ethanol, butanone extracts of *H.corymbosa* have

hepatoprotective activity in CCl₄ induced hepatic damage.¹⁸

Antihepatotoxic potential of methanolic extracts of *H.corymbosa* against D-Galactosamine induced hepatotoxicity in wistar rats was studied. Increased levels of marker enzymes with D-galactosamine (AST, ALT, ALP, γ -glutamyltransferase) were significantly reduced by *H.corymbosa* extract. The significant reduction in lipid peroxidation was observed at the dose of 200 mg/kg.¹⁹ The hepatoprotective activity of *H.corymbosa* was found to be quite similar to the reference hepatoprotective drug silymarin.

Antiulcer

The alcoholic and aqueous extract of whole plant of *Hedyotis corymbosa* has shown significant antiulcer activity against aspirin in rats. The alcoholic and the aqueous extract were administered in two doses 200 mg/kg and 400 mg/kg by oral route 45 minutes prior to the administration of aspirin. The standard drug lansoprazole 8 mg / kg was used for the comparison. Both the extract showed significant decrease in ulcer compared to control group. Antiulcer effect is characterized by reduction in ulcer index, gastric volume, free acidity, total acidity and pH. The protection percentage in alcoholic and aqueous extract at 200 mg/kg, 400mg/kg showed 65.7%, 33% respectively in comparison with standard lansoprazole 88.89%.²⁰

Antioxidant

The antioxidant activity of methanolic extract of aerial parts of *H.corymbosa* was determined by different invitro methods such as; 1,1 diphenyl-2-picryl hydroxyl (DPPH) assay, 2,2'-azinobis-3-ethylbenzothiazoline-6-sulfonic acid (ABTS) cation decolorization test, ferric reducing power (FRP), scavenging capacity towards hydroxyl ion (OH) radicals and nitric oxide (NO) radical inhibition assay. The methanolic extract of aerial part showed high antioxidant activity against DPPH, ABTS, Nitric oxide and hydroxyl radical at 82, 130, 150, 170 μ g/ml respectively. The study showed that *H.corymbosa* extract effectively attenuates the oxidative stress via antioxidant property.²¹

Analgesic

Oral dose of 250 and 500 mg/kg of ethanolic extract of *H.corymbosa* showed significant analgesic activity in mice using three different models; hot plate reaction time, acetic acid writhing test and formalin induced pain method, with ketorolac as standard drug. Formalin test procedure revealed the involvement of both peripheral and central mechanism. The acetic acid writhing test involved the peripheral mechanism and the hot plate method involves the central mechanism. The ethanolic extract of *H.corymbosa* showed significant anti nociceptive effect in 250 and 500 mg/kg, but more significant effect was observed at 500 mg/kg.²²

Anti malarial

Antimalarial activity of the methanolic extract of *H.corymbosa* was studied by both invitro and invivo methods. The plant extract showed significant antimalarial activity on chloroquine sensitive (MRC-pf20) and chloroquine sensitive (MRC-pf.303) stains of plasmodium falciparum. In-vivo antimalarial activity of the plant was studied using mice. Drug treatment was initiated 1 day (24 hr) prior to the parasite treatment starting from 4th day of post infection. Every alternate day, the blood was collected from tail to check the level of parasitaemia. The combination of plant extract with curcumin showed more effective antimalarial activity.²³

Antibacterial

Methanolic extract of *H.corymbosa* was evaluated for its antibacterial activity by disc diffusion method against gram positive and gram positive bacteria (*Bacillus*, *Klebsiella*, *Escherichia coli*, *proteus*, *staphylococcus aureus* and *pseudomonas*). The plant extract was observed to inhibit the growth of both gram positive and gram negative bacteria significantly and has broad spectrum of anti bacterial activity. The order of inhibition was found to be *Proteus* (22mm) < *Pseudomonas* (26mm) < *Bacillus* (27mm) < *Staphylococcus aureus* (28mm) < *Escherichia coli* (32mm) < *Klebsiella* (33mm).²⁴

Antifungal

The whole plant extract showed significant antifungal activities against *Candida albicans* and *Aspergillus nigar*. The maximum antifungal activity was found in *Candida albicans*. The Antifungal activity was due to the presence of the constituents like, steroids and glycosides.²⁴

Uterine Contraction

The ethanolic extract of *Hedyotis corymbosa* showed significant effect on uterine contraction, this was observed in the isolated uterine horn preparation of virgin female sprague Dawley rat. The extracts were tested in different concentration 0.014, 0.14, 0.44 and 1.40 mg/ml. De. Jalon solution was used as the physiological solution and the response was compared against the standard (acetylcholine) and blank (ethanol).²⁵ This study reveals that the plant has significant uterine contraction.

CONCLUSION

From ancient times plants have been used for the treatment of variety of ailments. Extensive literature survey reveals that *H.corymbosa* has a long history of traditional uses and that have been proved by many research works. The plant extract and some of the iridoid glycosides have been isolated from the plant have shown a variety of pharmacological activities like antioxidant, analgesic, anticancer, antibacterial, antiulcer, anti malarial, uterine contraction and hepatoprotective. From the above reported phytochemical and pharmacological



studies it has been proved that *H.corymbosa* can be useful for the development of commercial drugs.

So far from the current review, it can be concluded that the *H.corymbosa* plant has high medicinal value and is one of the nature's gifts to mankind. Several investigations are needed to find out the mechanism of action of each pharmacological activities of *H.corymbosa* since only a few reports are available in literature on its phytochemical, clinical and toxicity studies.

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