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Phytochemistry and pharmacological properties of *Phyllanthus amarus* Schum: A review

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Abstract

Medicinal plants are important for human health by prevention of several human diseases. One of such medicinal plant species which used widely is *Phyllanthus amarus*. This herb is used as traditional medicine in many countries for more than 3,000 years. It is popular in indigenous system of medicine like ayurveda, siddha, unani homoeopathy and is used for its hepatoprotective, antitumour, antidiabetic, antihypertensive, analgesic, anti-inflammatory and antimicrobial properties. The plant is also used in dropsy, jaundice, diarrhoea, dysentery, intermittent fevers, cold and has a good anti-viral activity against hepatitis B virus. *Phyllanthus amarus* has also served as lead for several experimental investigations that explored its phytochemical constituents and pharmacological uses. The Present review compiles traditional uses, phytochemical and pharmacological properties of *Phyllanthus amarus*.

Keywords: *Phyllanthus amarus* Schum, traditional uses, phytochemical and pharmacological properties

Introduction

Phyllanthus amarus is also known as “Bhui amla” and is belonging to the family Euphorbiaceae. It is a very large genus and has about approximately 550 to 750 species which are found in tropical and subtropical countries of the world. It is an annual herb grows to a height 6 inches-15 inches. Stem is angular with numerous distichous, elliptic oblong leaves. Flowers are yellowish, whitish or greenish, axillary, males flowers in groups of 1-3 whereas females are solitary. Fruits are depressed-globose like smooth capsules present underneath the branches and seeds are trigonous, pale brown with longitudinal parallel ribs on the back. The plant has been found in Philippine, Cuba, Nigeria and among others. In India, *Phyllanthus amarus* is widely distributed as a weed in cultivated and waste lands.

Taxonomy

Kingdom	:	Plantae
Division	:	Angiospermae
Class	:	Dicotyledoneae
Order	:	Tubiflorae
Family	:	Euphorbiaceae
Genus	:	<i>Phyllanthus</i>
Species	:	<i>amarus</i>



Fig 1: *Phyllanthus amarus*

Traditional Uses

Phyllanthus amarus herb has a number of traditional uses in several health related problems such as diarrhoea, dysentery, dropsy, jaundice, intermittent fevers, urinogenital disorders,

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scabies and wounds. Further, these are used in the treatment of kidney problems, urinary bladder disturbances, pain, gonorrhoea, diabetes and chronic dysentery. Topically, it is used for several skin problems such as skin ulcers, sores, swelling and itchiness, wounds, scabies and tubercular ulcers, ringworm, scabby and crusty lesions. It has a urolithic property, dissolving renal calculi. Also, used in cough, asthma and other bronchial infections. It is used in the treatment of gallstones, other kidney related problems, appendix inflammation and prostate problems. Because of its efficacy in the field of gastro-intestinal disorders it is used in the treatment of disorders like dyspepsia, colic, constipation and dysentery. The herb has found to be effective in several female problems such as in leucorrhoea, menorrhagia and mammary abscess and can act as galactagogue. The young shoots of plant are administered in the form of an infusion for the treatment of chronic dysentery. Fresh leaf paste has wound healing capacity and used to cure white spots on skin & jaundice. The stem juice is also used as wound healers. The whole plant extract is used in urinary problems & swelling of liver. The root extract is used to cure stomach pain. The flower paste of *Phyllanthus amarus* is applied externally as antidote against snake bite.

Phytochemical Studies

Phyllanthus amarus have numerous phytochemical constituents such as alkaloids, flavonoids, tannins, lignins, polyphenolic compounds and tetracyclic triterpenoids. Several phytoconstituents isolated from this plant.

Pharmacological Activity

Anticancer Activity

The aqueous extract of *Phyllanthus amarus* demonstrates potent anticancer activity against 20- methylcholanthrene (20-MC) induced sarcoma development. The aqueous extract inhibits DNA topoisomerase II of mutant cell cultures and inhibited cell cycle regulatory enzyme cdc 25 tyrosine phosphatase of *Saccharomyces cerevisiae*. The anticarcinogenic and anti-tumour activity of *Phyllanthus amarus* proposed to be inhibition of metabolic activation of carcinogen as well as the inhibition of cell cycle regulators responsible for cancerous growth and DNA repair.

Antioxidative Activity

The DPPH assay is used to determine the antioxidant potential, which is based on the reduction of stable radical DPPH to yellow coloured diphenyl picryl hydrazine. Thus, the ability of the test samples to quench this radical is a measure of its antioxidative ability. *Phyllanthus amarus* have powerful antioxidant property. In another study, it has been found that boiled water extract of the fresh and dried *Phyllanthus amarus* plant had comparatively greater antioxidant activity than microwave assisted extraction method employed for the extraction.

Actions on Kidney Stones & Uric Acid

In a clinical study it is reported that a significant increase in diuresis and sodium and creatine excretion after 1-3 months treatment with *Phyllanthus amarus* tea. Calcium oxalate crystals are the building blocks of most kidney stones can be prevented by the administration of *P. amarus* proved in an in-vitro clinical study. *P. amarus* also increased bile acid secretion (demonstrated choleric activity) and significantly lowered blood cholesterol levels in rats.

Antinociceptive Activity

The hydroalcoholic extract of four *Phyllanthus* species namely *Phyllanthus amarus*, *Phyllanthus orbiculatus*, *Phyllanthus fraternus* and *Phyllanthus stipulatus* were given intraperitoneally and evaluated in acetic acid-induced writhing and formalin and capsaicin-induced licking effects. In the formalin test, it was observed that the hydroalcoholic extract of four species produced graded inhibition against both phases of formalin-induced licking, inhibition in licking being more active in the late phase. Apart from the above models, hydroalcoholic extract of the species also elicited significant reduction in the capsaicin-induced neurogenic pain. It was also observed that hydroalcoholic extract of the *Phyllanthus* species was less potent and efficacious when given orally compared to intraperitoneal route.

Antimicrobial Activity

Antimicrobial activity of ethanol and water extracts of *Phyllanthus amarus* were evaluated against the test organisms *Salmonella typhi*. This study establishes one of the traditional uses of *Phyllanthus amarus* against typhoid fever. In another study, hexane, petroleum ether, chloroform, acetone and methanol extract of *Phyllanthus amarus* leaves were tested for antibacterial activity against *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Streptococcus faecalis*, *Enterobacter species*, *Serratia marcescens*, *Staphylococcus aureus* and *Escherichia coli* by agar well diffusion method. The results demonstrated methanol extract of *Phyllanthus amarus* for highest inhibitory activity against above bacterial species. Similarly, in another study antimicrobial potential of *Phyllanthus amarus* were investigated using agar well diffusion method for activity against several drug resistant pathogens such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella Species*.

Antileptospiral Activity

Leptospirosis is globally important disease found mainly wherever human come in contact with the urine of infected animals or urine contaminated environment. *Phyllanthus amarus* have been investigated for the antileptospiral activity by micro dilution tests and tube dilution technique. The results revealed the inhibitory action of methanolic and aqueous extract of whole plant of *Phyllanthus amarus* against leptospira.

Anticonvulsant Activity

Epilepsy is a major neurological disorder characterized by the occurrence of recurrent seizures. The two widely proposed mechanisms involve alterations in the voltage-dependent ion channels such as reduction in inhibitory GABA-mediated drive or increase in excitatory glutamate mediated inputs. This chronic progressive CNS disorder affects a large population of the world. In search of herbal treatment, aqueous and ethanolic extract of *Phyllanthus amarus* were evaluated for anticonvulsant effect using pentylenetetrazole (PTZ) and maximal electroshock-induced seizures (MES) in swiss albino rats. The result showed ethanolic and aqueous extract of leaves and stem of *Phyllanthus amarus* significantly effective in abolishing hind limb extension induced by MES as well as PTZ induced seizures.

Antidiabetic Activity

Diabetes is a metabolic disorder of carbohydrate and is

considered as the world's largest endocrine disease. The antidiabetic potential of *Phyllanthus amarus* investigated in an experiment model where fasted rats were made diabetic by single intraperitoneal injection of 60 mg/kg of stz model and then two doses of the aqueous and hydroalcoholic extract of *Phyllanthus amarus* administered orally which were then compared with the normal control group that received distilled water only. After 15 days treatment the result demonstrates aqueous and hydroalcoholic extract of *Phyllanthus amarus* decrease the blood glucose level significantly. Serum analysis of the treated experimental animals showed an increase in insulin and reduction in the malondialdehyde concentration, therefore demonstrated the potential antidiabetic property of aqueous and hydroalcoholic extract of *Phyllanthus amarus*. In another study the methanolic extract of *Phyllanthus amarus* was found to inhibit lipid peroxidation & scavenge hydroxyl and superoxide radicals. Since free radicals are linked with diabetes, therefore quenching of free radical could be one mechanism of action.

Anti-Inflammatory Activity

The Hexane extract (HE), the lignan-Rich Fraction(LRF), or the lignans phylltetralin, nirtetralin, niranthin of *Phyllanthus amarus* when given orally inhibited carrageenan (Cg)-induced paw oedema and neutrophil influx. The Hexane Extract, the LRF, or nirtetralin also inhibited the increase of IL1- β tissue levels induced by Carrageenan. Bradykinin (BK)-, platelet activating factor (PAF)- and endothelin-1 (ET-1)-induced paw oedema were significantly inhibited by the HE or LRF. Finally, nirtetralin or phylltetralin caused inhibition of paw oedema induced by PAF or ET-1. These results show that the HE, the LRF and the lignans niranthin, phylltetralin and nirtetralin exhibited marked anti-inflammatory potential.

Nephroprotective and Cardioprotective Activity

Nephroprotective and cardioprotective effect of *Phyllanthus amarus* is evident from the study in which methanol extract of *Phyllanthus amarus* leaves caused a significant dose dependent decrease in the levels of total cholesterol, urea, total protein, uric acid, and prostatic, alkaline and acid phosphatases, aspartate transaminase (AST) and alanine transaminase (ALT). Since increase in these enzymes is related to hepatic and heart disorders therefore their reduction shows that the leaves of *Phyllanthus amarus* have hepatoprotective, nephroprotective and cardioprotective properties.

Antiviral Activity

Phyllanthus amarus possess antifungal, antiviral properties. Antiviral activity of *Phyllanthus* species were evidenced from experiment study where aqueous extract of *Phyllanthus amarus* along with other species of *Phyllanthus* genus were evaluated against Herpes Simplex Virus type-1 and Herpes Simplex Virus type-2 in vero cells by quantitative polymerase chain reaction. Western blot and 2D-gel electrophoresis were used to study protein expressions of treated and untreated infected vero cells. *Phyllanthus amarus* along with *Phyllanthus urinaria* demonstrate the strongest antiviral activity against *Herpes Simplex Virus type-1* and *Herpes Simplex Virus type-2* which is proposed to its action in the early stage of infection and replication.

Conclusion

Phyllanthus amarus possesses flavonoids, alkaloids, lignans etc. The pharmacological activities mentioned in this review

establish the therapeutic value of this herb. Thus activity guided phytochemical may leads to development of novel agents for various disorders. The available literature regarding the chemical compositions and pharmacological activities appear to be very impressive.

References

1. Mazumder A, Mahato A, Mazumder R. Antimicrobial potentiality of *Phyllanthus amarus* against drug resistant pathogens. Natural Product Research. 2006; 20(04):323-326.
2. Tahseen M, Mishra G. Ethnobotany and Diuretic Activity of Some Selected Indian Medicinal Plants. The Pharma Innovation. 2013; 2:112.
3. Ito E, Ukana D, Ekaete D. Phytochemical screening and nutrient analysis of *Phyllanthus amarus*. Asian Journal of Plant Science and Research. 2013; 3:116-122.
4. Sayyada Khatoon Vartika Rai, "Comparative pharmacognostic studies of three *Phyllanthus* species. Journal of Ethnopharmacology. 2006; 104:79-86.
5. Joseph B, Raj SJ. An Overview: Pharmacognostic Property of *Phyllanthus amrus* linn. International Journal of Pharmacology. 2011; 1:41.
6. Chandewar A, Dhongade H. Pharmacognostical and Phytochemical studies of *Phyllanthus amarus* leaves. International Journal of Biomedical and Advance Research. 2013; 4:383.
7. Adegoke AA, Iberi PA, Akinpelu DA, Aiyegoro P. Studies on phytochemical screening and antimicrobial potentials of *Phyllanthus amarus* against multiple antibiotic resistant bacteria. International Journal of Applied Research in Natural Products. 2010; 3:6.
8. Patel JR, Tripathi P, Sharma V, Chauhan NS, Dixit VK. *Phyllanthus amarus* Ethnomedicinal uses phytochemistry and pharmacology: A review. Journal of Ethnopharmacology. 2011; 138(2):286-313.
9. Zingare A. Antimicrobial activity of six members of Euphorbiaceae. New Interdisciplinary National Research Journal. 2013; 2:112.
10. Khatoon S, Rai V, Rawat A. Comparative pharmacognostic studies of three *Phyllanthus* species. Journal of Ethnopharmacology. 2004; 104:79-86.
11. Sen A, Batra A. The study of in vitro and in vivo antioxidant activity and total phenolic content of *Phyllanthus amarus* Schum Thonn: A medicinally important plant. International Journal of Pharmacy and Pharmaceutical Sciences. 2013; 5:947.
12. Ushie O, Neji P, Etim E. Phytochemical screening and antimicrobial activities of *Phyllanthus amarus* stem bark extracts. International Journal of Modern Biology and Medicines. 2013; 3:101-112.
13. Rajeshkumar NV, Joy KL, Kuttan G, Ramsewak RS, Nair MG, Kuttan R. Antitumour and anticarcinogenic activity of *Phyllanthus amarus* extract. Journal of Ethnopharmacology. 2002; 81(1):17-22.
14. Lim Y, Murtijaya J. Antioxidant properties of *Phyllanthus amarus* extracts as affected by different drying methods. Food Science and Technology. 2007; 40(9):1664-1669.
15. Murugaiyah V et al. Antihyperuricemic lignans from the leaves of *Phyllanthus niruri*. Planta Med. 2006; 72(14):1262-7.
16. Micali S, et al. Can *Phyllanthus niruri* affect the efficacy of extracorporeal shock wave lithotripsy for renal stones? A randomized, prospective, longterm study. J Urol. 2006;

176(3):1020-2.

17. Itoro E, Ukana D, Ekaete D. Phytochemical screening and nutrient analysis of *Phyllanthus amarus*. Asian Journal of Plant Science and Research. 2013; 3:116-122.
18. Oluwafemi F, Debiri F. Antimicrobial Effect of *Phyllanthus amarus* and *Parquetina nigrescens* on *Salmonella typhi*. African Journal of Biomedica Research. 2008; 11(2):215-219.
19. Saranraj P, Sivasakthivelan P. Screening of Antibacterial Activity of the Medicinal Plant *Phyllanthus amarus* Against Urinary Tract Infection Causing Bacterial Pathogens. Applied Journal of Hygiene. 2012; 1(3):19-24.
20. Chandan S, Umesha S, Balamurugan V. Anti Leptospiral Antioxidant and DNA damaging properties of *Eclipta alba* and *Phyllanthus amarus*. Open Access Scientific Reports. 2012; 1(4):1-8.
21. Manikkoth S, Deepa B, Joy AE, Rao S. Anticonvulsant activity of *Phyllanthus amarus* in experimental animal models. 2011; 4:144-149.
22. Moshi MJ, Lutale JJ, Rimoy GH, Abbas ZG, Josiah RM, Swai AB. The effect of *Phyllanthus amarus* aqueous extract on blood glucose in non-insulin dependent diabetic patients. Phytotherapy Research. 2001; 15(7):577-80.
23. Evi PL, Degbeku K. Antidiabetic Activity of *Phyllanthus amarus* Schum and Thonn on Alloxan induced diabetes in Male Wistar Rats. Journal of Applied Sciences. 2011; 11(16):2968-2973.
24. Kiran D, Rohilla A, Rohilla S. *Phyllanthus amarus* an ample therapeutic potential herb. International Journal of Research in Ayurveda & Pharmacy. 2011; 2(4):1099.
25. Oberley LW. Free radicals and diabetes. Free Radical Biology and Medicine. 1988; 5(2):113-24.
26. Kassuya CAL, Daniela FPL, Lucilia VM, Vera-Lucia GR, Joao BC. Anti-inflammatory properties of extract, fractions and lignans isolated from *Phyllanthus amarus*. Planta Med. 2005; 71:721-726.
27. Obianime AW, Uchie FI. The phytochemical screening and the effects of methanolic extract of *Phyllanthus amarus* leaf on the biochemical parameters of male guinea pigs. Journal of Applied Sciences and Environmental Management. 2008; 12(4):73-77.
28. Tan W, Jaganath I, Manikam I. Evaluation of antiviral activities of four local Malaysian *Phyllanthus* species against Herpes simplex viruses and possible antiviral target. International Journal of Medical Sciences. 2013; 10(13):1817-1892.