Systematic Review On Phyllanthus Amarus

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1.Abstract

Phyllanthus amarus Schum. & Thonn. belongs to the family Euphorbiaceae is a small herb well known for its medicinal properties and widely used worldwide. It has various applications in tradition and folk medicine for treatment of various diseases such as hepatitis, cough, diuretic, menstruation problem and dysentery. It is commonly used by many countries across the world. Scientific investigation revealed that Phyllanthus amarus has potent activity against various diseases such as hepatitis B, HIV, microbial infections, plasmodiasis, nematode infestation, lithiasis, hyperlipidemia, diabetes, hyperuricemia, nephrotoxicity, platelet aggregation, radiation exposure, algesia, unwanted pregnancy, vasoconstriction, hepatotoxity and biological oxidation. Phyllanthus amarus contains several phytochemical constituents such as alkaloid, flavonoid, terpenoids, cardiac glycoside, saponins, tannins, cyanogenic glycosides while proximate analysis showed that it contained high carbohydrate and fibre content. Several important chemical compounds were isolated from Phyllanthus amarus such as phyllanthin, hypophyllanthin, Niranthin, Nirtetralin, phyltetralin phyllangin, nirphyllin, phyllnirurin and corilagin. Study showed that these compounds are responsible for several pharmacological activities.

Key words: Phyllanthus amarus, activity, disease, Constituents

Introduction

Phyllanthus niruri, also known as Phyllanthus amarus Schum. & Thonn., is commonly called Dukung Anak in Malaysia and Iyin Olobe among the Yoruba of Nigeria. It belongs to the Euphorbiaceae family and is believed to have originated in tropical America before spreading widely across tropical and subtropical regions. The plant is an annual herb or small shrub that grows as a weed in moist, humid areas [1, 2]. Among the 500+ species of the Phyllanthus genus found in temperate and tropical regions [3], P. niruri is well recognized for its small stature (30–40 cm), small leaves, yellow flowers, green capsules, and seeds marked with longitudinal ridges [4]. The species grows throughout West Africa, Europe, Asia, the Indian Ocean islands, and Central and South America, where it is used extensively in traditional medicine [5–9]. In Ayurveda, it has been used for centuries to treat conditions such as jaundice, asthma, hepatitis, and urinary stones [10, 11].

Fig.1 Phyllanthus Amarus

Phyllanthus amarus produces numerous bioactive compounds, including alkaloids, flavonoids, tannins, triterpenes, lignans, polyphenols, sterols, and essential oils. Important lignans include phyllanthin, hypophyllanthin, niranthin, phyltetralin, nirtetralin, hinokinin, and related derivatives. The plant also contains flavonoids (e.g., rutin, gallocatechin, kaempferol), ellagitannins (such as geraniin, amariin, and phyllanthusiins A–D), melatonin, securinega-type alkaloids (epibubbialine, isobubbialine), and sterols like amarosterol A and B (12–19). Extracts from P. amarus exhibit diverse pharmacological activities, including antimicrobial, antiviral, antidiabetic, antioxidant, anticancer, hepatoprotective, nephroprotective, and anti-inflammatory effects (18–19).

3. Botanical Classification

- Phyllanthus niruri L.
- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliopsida
- Order: Euphorbiales
- Family: Euphorbiaceae
- Genus: Helianthus
- Species: niruri

4. Vernacular Names

- Assamese: Holpholi, Poram-lokhi
- Bengali: Noar
- Hindi: Chalmeri, Harfarauri, Bhuiaonla
- Kannada: Kirunelli, Nela Nelli
- Konkani: Bhuin-avalae
- Telugu: Ratsavusirike, Nela Usiri
- Sanskrit: Amala, Bhuyamlaki
- Malayalam: Arinelli, Kizhanelli, Nellipuli
- Marathi: Rayavali, Bhuiavli
- Oriya: Narakoli

5. Pharmacological Activity

5.1 Antidiabetic (Hypoglycemic) Activity

Chronic hyperglycaemia increases oxidative stress, contributing to diabetes complications. Studies show that Phyllanthus niruri extracts reduce fasting glucose, improve glucose tolerance, and protect pancreatic tissue. These actions may result from enzyme inhibition involved in carbohydrate digestion, insulin-like effects, or enhanced insulin release, reflected by increased hepatic glycogen and hexokinase activity. However, results across Phyllanthus species remain inconsistent due to variations in extraction, dosing, and diabetes induction methods (20).

5.2 Hypolipidaemic Activity

Lipid-lowering effects of P. amarus have been studied mainly in rats, with little mechanistic research. Existing evidence suggests antioxidant-linked lipid reduction, improved LCAT activity, normalization of lipase function, and enhanced LDL receptor activity. Extracts also increase HDL and bile-acid excretion. Flavonoids likely promote lipid catabolism. Effects are dose-dependent and sometimes comparable to glibenclamide. Some studies reported weight gain, so caution is needed in diabetic or obese individuals. Overall, more standardized, comparative studies are required (20).

5.3 Antiplatelet & Vasorelaxant Activity

Methyl brevifolin carboxylate from P. niruri relaxes vascular smooth muscle by reducing calcium influx and inhibits platelet aggregation (20).

5.4 Spasmolytic Activity

Alkaloid-rich extracts of P. niruri show smooth-muscle relaxation in the urinary and biliary tract. Ether extracts exhibited the strongest antispasmodic effect in tissues such as guinea pig ileum and rat uterus (20).

5.5 Immunomodulatory Activity

P. niruri extract stimulates B and T lymphocyte proliferation, enhances IFN-γ and IL-4 production, boosts macrophage phagocytosis and TNF-α release, and promotes dendritic cell maturation and antigen presentation. These actions indicate broad immuno-enhancing properties (20).

5.6 Antiviral Activity

P. niruri shows strong activity against HBV and WHV by inhibiting DNA polymerase and viral replication. Clinical trials report up to 50–60% HBsAg seroconversion. Extracts also demonstrated anticancer benefits in hepatocellular carcinoma models. Anti-HIV effects were also observed, especially from niruriside, which inhibits REV–RRE interaction (21).

5.7 Antifertility Effects

Extracts of P. amarus reduced sperm count, motility, fertility, and litter size in several animal models. Effects were dose-dependent but reversible upon discontinuation. Hormonal modulation of testosterone, LH, and FSH was also reported (21).

5.8 Cardiovascular Activity

Methyl brevifolincarboxylate relaxes blood vessels and inhibits platelet aggregation. Aqueous extracts prevented high-fructose–induced cardiac lipid elevation. Ethanolic extracts also demonstrated diuretic activity similar to furosemide, without causing potassium loss (21).

5.9 Chemopreventive & Antimutagenic Activity

P. amarus protects against carcinogenesis induced by NDEA, MNNG, and other mutagens by antioxidant action, modulation of P450 enzymes, and inhibition of topoisomerase II. Extracts also reduced DNA damage and urinary mutagenicity in animals (21).

5.10 Antioxidant Activity

Both P. amarus and P. niruri have potent radical-scavenging activity, especially in DPPH assays. Extracts protect against CCl_4-induced oxidative damage and enhance enzymic and non-enzymic antioxidants. Phyllanthin shows strong individual antioxidant effects. Extracts also reduce ROS, lipid peroxidation, and heavy metal–induced toxicity (22, 21).

5.11 Toxicity

High doses of aqueous extracts may cause anaemia, elevated liver enzymes, weight loss, and organ damage in animals. However, some studies indicate relative safety with LD_{50} above 5 g/kg. Toxicity results vary due to differences in methodology (21).

5.12 Antiplasmodial Activity

Ethanolic and aqueous extracts inhibit Plasmodium falciparum development, especially the trophozoite-to-schizont transition. The compound 1-O-galloyl-6-O-luteoyl-β-D-glucose showed activity against chloroquine-sensitive strains (21).

5.13 Lithiasis (Anti-urolithic Activity)

P. niruri inhibits calcium oxalate crystal formation and reduces stone growth in vitro and in vivo. Human studies showed reduced urinary calcium in stone-forming patients (21).

5.14 Nephroprotective Activity

Extracts protect against gentamicin-, paracetamol-, and cisplatin-induced nephrotoxicity by normalizing electrolytes, reducing urea/creatinine levels, and preventing histological damage (21).

5.15 Radioprotective Activity

P. amarus enhances antioxidant defences in irradiated mice and reduces chromosomal and intestinal damage through reduced lipid peroxidation (21).

5.16 Anti-Inflammatory Activity

Hexane extracts and lignans such as nirtetralin and phyltetralin reduce carrageenan-induced oedema, neutrophil infiltration, and inflammatory mediators like IL-1β, BK, PAF, and ET-1 (22).

5.17 Anticonvulsant Activity

Aqueous and ethanolic extracts reduce seizure activity in PTZ and MES models by preventing hind limb extension and suppressing convulsions, indicating CNS-modulating effects (22).

5.18 Kidney Stone & Uric Acid Effects

Regular intake of P. amarus tea increases urine output, enhances sodium and creatinine excretion, and inhibits calcium oxalate crystal formation. The plant also promotes bile flow and reduces cholesterol (22).

5.19 Antimicrobial Activity

Extracts show strong effects against Salmonella typhi and multiple pathogenic bacteria. Methanolic extract is most effective, including activity against MDR strains (E. coli, P. aeruginosa, Klebsiella, S. aureus) (22).

5.20 Anti-venom Activity

A combination of Andrographis paniculata and P. amarus neutralizes cobra venom; 0.24 mg extract can neutralize 2 LD_{50} of Naja naja venom (23).

5.21 Antileptospiral Activity

Methanolic extract of P. amarus inhibits Leptospira species in microdilution assays, supporting its use against leptospirosis (23).

6.Summary

Phyllanthus amarus ek chhota sa herb hai jo tropical areas me milta hai aur Ayurveda, Siddha aur African medicine me purane time se use hota aa raha hai. Is plant me lignans, flavonoids, tannins, alkaloids aur polyphenols jaise active compounds hote hain. Important compounds jaise phyllanthin, hypophyllanthin, niranthin, rutin aur geraniin iske medicinal effects ko strong banate hain. Research ke mutabik, P. amarus antiviral (specially Hepatitis B), antidiabetic, hypolipidemic, antioxidant, anti-inflammatory, hepatoprotective, antimicrobial aur nephroprotective activities show karta hai. Ye immune cells ko activate karke immunity bhi improve karta hai.

7.Conclusion

Phyllanthus amarus aur Phyllanthus niruri dono hi medicinal plants hain jisme flavonoids, alkaloids aur lignans jaise useful compounds hote hain. Traditional systems me inka use liver diseases, jaundice, hepatitis, kidney stones aur infections me hota raha hai. Modern studies bhi confirm karti hain ki phyllanthin jaise compounds liver ko protect karte hain aur kidney stone formation ko rokne me madad karte hain. Overall, ye dono plants multiple diseases ke treatment me therapeutic potential rakhte hain.

9.Referance

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