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Phyllanthus Genus: A Comprehensive review article

Arpit Kumar Sharma*[1], Harishchandra Verma[2], Sumit Durgapal[3]

[1,2] Teerthankar Mahavir college of Pharmacy, TMU Moradabad

3Department of Pharmaceutics, Uttaranchal Institute of Pharmaceutical Sciences, Uttaranchal University, Premnagar, Dehradun.

Corresponding Author

Arpit Kumar Sharma

Teerthankar Mahavir college of Pharmacy, TMU Moradabad

Email ID : assharma426.as@gmail.com,

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ABSTRACT

Different types of plants such as Phyllanthus amarus, Phyllanthus Fluitans, Phyllanthus Nilruri, Phyllanthus Urinaria, Phyllanthus emblica, Phyllanthus Reticulatus and Phyllanthus Fraternus comes under the Phyllanthus Genus. Mostly plants shown the different types of biological activities such as antioxidant, Cytotoxic, antispasmodic, pain reliever, anti inflammatory, Liver protective, Detoxification, lipid lowering, antifertility, antimicrobial, anticancer, Immunomodulator, antiviral, antiulcer, nematocidal activity and as HIV replication inhibitor. Above newly discovered plant has been showed much potent activity and this activity in beneficial for human being but Phyllanthus Fluitans is still a new discovered plant that has not been given any activity record..

Keywords: *Phyllanthus, HIV replication, cytotoxic, Urinaria, Fluitans, antimicrobial activity.*

1. INTRODUCTION

Aquatic and semi-aquatic plants are plants that grow in or near water and they have been used for medicinal purposes for centuries. Many aquatic and semi-aquatic plants have been shown to have medicinal properties, and they are used in traditional and modern medicine to treat a wide range of conditions. [1]

Some examples of aquatic and semi-aquatic plants that have been used for medicinal purposes include:

- Water lilies: The root of the water lily has been used to treat burns, wounds, and skin conditions. The leaves and flowers have been used to treat pain and swelling.
- Watercress: Watercress has been used to treat respiratory conditions and to boost the immune system. It is also rich in antioxidants and has been shown to have anti-cancer properties.
- Lotus: The root of the lotus has been used to treat digestive issues and to improve circulation. The seeds have been used to treat anxiety and insomnia.
- Marshmallow: The root of the marshmallow has been used as anti-inflammatory and antioxidant.
- In addition to these plants, there are many other aquatic and semi-aquatic plants that have been used for medicinal purposes. It is important to note that while some of these plants have been shown to have medicinal properties, more research is needed to determine effectiveness and uses of various other un explored Aquatic and semi-Aquatic Plants.

Plant classification & Characteristics:-

- Preferred Scientific Name - Phyllanthus fluitans
- Domain – Eukaryota
- Kingdome – plantae
- Phylum – spermatophyte

Subphylum – angiospermae
Class – dicotyledonae
Order – euphorbiales
Genus – Phyllanthus
Species – Phyllanthus fluitans
Common Name- floating spurge
Type - Herbaceous perennial
Family- Phyllanthaceae[1]

Figure-1- leaves of *Phyllanthus fluitans* Figure-2: Roots of *Phyllanthus fluitans*

Figure-3: *Phyllanthus* species (Phyllanthaceae); (A) *P. amarus*, (B) *P. urinaria*, (C) *P. emblica*, (D) *P. niruri*,

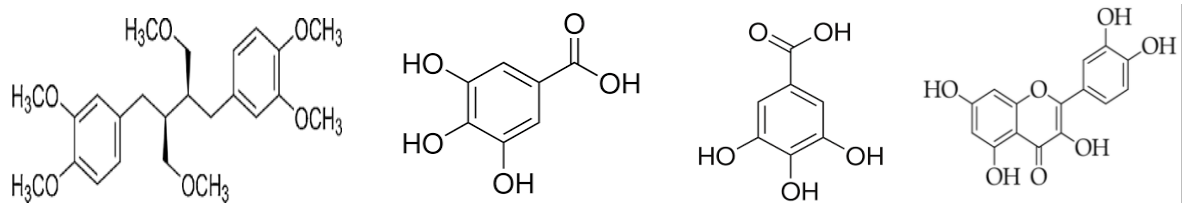
Figure-4: *Phyllanthus* species (Phyllanthaceae); (E) *P. acidus*, (F) *P. fraternus*, (G) *P. reticulatus*, and (H) *P. simplex*.

Chemical constituents: -Chemical constituents of some *Phyllanthus* species shown in table no-1.

Table no-1 Chemical constituents of *Phyllanthus* species

Phyllanthus Species	**Chemical Constituents**
Phyllanthus emblica	Vitamin C, tannins, flavonoids, polyphenols, gallic acid, and ellagic acid
Phyllanthus amarus	Lignans (e.g., phyllanthin, hypophyllanthin), alkaloids, tannins, and flavonoids
Phyllanthus niruri	Lignans, alkaloids, flavonoids, terpenes, saponins, and polyphenols
Phyllanthus acidus	Flavonoids, tannins, gallic acid, and ascorbic acid
Phyllanthus fraternus	Lignans, alkaloids, tannins, and flavonoids
Phyllanthus urinaria	Lignans (phyllanthin), tannins, flavonoids, and alkaloids
Phyllanthus reticulates	Flavonoids, tannins, alkaloids, and polyphenols
Phyllanthus simplex	Tannins, flavonoids, and alkaloids
Phyllanthus debilis	Lignans, flavonoids, tannins, and alkaloids
Phyllanthus acidus	Ascorbic acid, tannins, polyphenols

Chemical structure of constituents are given in Figure no-5



Phyllanthin **b. Corilagin** **c. gallic acid** **d. Quercetin**

Figure no-5: Chemical structure of constituents

Activities of *Phyllanthus* species- Phyllanthus genus hown different types of activities such as antimicrobial, anticancer, antiulcer, antioxidant activity etc which are given below in table no-2.

Table no-2-: Species name, compound name and their activities

Phyllanthus Species	**Compound Name**	**Activities**
P. amarus, P. niruri	Phyllanthin	Hepatoprotective, anti-inflammatory
P. amarus, P. fraternus	Hypophyllanthin	Hepatoprotective, anti-viral
P. emblica, P. niruri	Corilagin	Antioxidant, anti-inflammatory
P. amarus, P. urinaria	Geraniin	Anti-viral, anti-diabetic
P. emblica, P. acidus	Gallic Acid	Antioxidant, anti-inflammatory
P. emblica, P. niruri	Ellagic Acid	Antioxidant, anti-carcinogenic
P. niruri, P. amarus	Quercetin	Antioxidant, anti-inflammatory
P. emblica, P. acidus	Kaempferol	Antioxidant, cardioprotective
P. emblica, P. niruri	Rutin	Antioxidant, anti-inflammatory
P. niruri, P. fraternus	Beta-Sitosterol	Anti-inflammatory, cholesterol-lowering
P. fraternus, P. niruri	Lupeol	Anti-inflammatory, wound healing
P. emblica, P. amarus	Catechin	Antioxidant, anti-diabetic
P. emblica, P. amarus	Epicatechin	Antioxidant, cardioprotective
P. niruri, P. amarus	Saponins	Antimicrobial, anti-inflammatory
P. amarus, P. niruri	Alkaloids (securinine)	Anti-microbial, anti-spasmodic

Therapeutic studies on species *Phyllanthus: -*

About 514 compounds have been isolated from different species of Phyllanthus, including 126 terpenoids, 102 phenyl propanoids, 73 phenols, 54 flavonoids, 53 tannins, 33 sterols, 31 alkaloids and a number of other compositions. Their wide range of biological activities such as antiviral, antioxidant, antidiabetic, anticancer, anti-inflammatory, hypolipidemic, immunomodulatory, and antidepressant activities are tested using polar solvents (water, methanol, and ethanol) extracts. These extracts are considered rich in phenols, flavonoids, and tannins, which may exhibit antioxidant activity in different degree due to their hydroxyl. Consequently, most bioactivities of Phyllanthus may be correlated with the hydroxyl rich compounds. In recent years, the traditional uses of Phyllanthus had been partly confirmed and more evidences such as pharmacological researches and clinical studies are urgently needed to be taken. Further studies of phytochemical discovery

and subsequent screenings are necessary to be taken to extend the use of Phyllanthus and to develop leading compound. [11, 12]

Chankapiedra (*Phyllanthus niruri* Linnaeus, Euphorbiaceous) is a widely distributed annual herb found in tropical and subtropical regions across the globe, particularly abundant in coastal areas of India. It has been a part of the Indian Ayurvedic medicinal system for over 2,000 years. With a short life cycle, P. niruri is commonly considered a field weed, and its genus, Phyllanthus, consists of 600–700 species with subtle distinguishing features. In Ayurveda, extracts of Phyllanthus niruri are used as remedies for various conditions, including bronchitis, anemia, leprosy, asthma, and urinary disorders. The ancient Ayurvedic text *Charaka Samhita* highlights its effectiveness in treating asthma, stimulating liver function, improving digestion, increasing appetite, and acting as a laxative. Maharshi Charaka categorized it as:

Kasahara: alleviating cough,

Swasahara: relieving asthma,

Mootrarogahara: curing urinary disorders,

Kaphapittahara: addressing imbalances in kapha and pitta doshas,

Kaamalaahara: treating jaundice.

Additionally, the *Bhavaprakasha Nighantu* records its use for managing coughs and blood disorders. Despite its bitter taste, it is described as sweet in post-digestive effect (*vipaka*) and is also recognized for its astringent properties. [2]

Phyllanthus is one of the largest genus in the family Phyllanthaceae and is in constant use in traditional medications to cure diverse human diseases, in confectionaries, food industry, and also in some pesticides. Phyllanthus species enriched with diversity of phytochemical e.g., tannins, terpenes, alkaloids, glycosidic compounds, saponins, and flavones etc. During 2016–2018, almost 81 compounds have been isolated from Phyllanthus spp. the majority of which are phenylpropanoids, triterpenoids, di terpenoids, and flavonoids. These chemical compounds from Phyllanthus species bear diverse biological activities, and hence demand in depth pharmacological studies for their potential use in Pharma industry. [16]

Authors isolated various chemical compound which are represented is the form of chemical structures. [17,18,19]

Nine flavonoids from the *Phyllanthus* genus exhibit xanthine oxidase inhibitory activity, including quercetin, rutin, apigenin, luteolin, myricetin, catechin, epicatechin, and epigallocatechin, with IC50 values ranging from 0.44 µM to over 100 µM. Quercetin and apigenin demonstrate the strongest inhibition (IC50 = 0.44 µM). The interaction between planar rings A and C of flavones and amino acids Phe1009 and Phe914 is crucial for xanthine oxidase inhibition. Hydroxyl group positioning influences activity: groups at 5, 7, 3', and 4' enhance inhibition, while those at 2', 3, and 8 reduce it. [20]

2. CONCLUSION:

The present study of *Phyllanthus Genus* provided the basic ideas about introduction, chemical constituents and their activities. This review also provides the general concept regarding the different types of therapeutics activities.

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