



Phyllanthus acidus: A Comprehensive Review of Its Pharmacological Activities

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ABSTRACT

The deciduous fruit-bearing tree *Phyllanthus acidus* (L.) Skeels, also called the Otaheite gooseberry or star gooseberry, is a member of the Phyllanthaceae family. Originating in tropical areas, it is commonly grown for its tart, delicious fruits and prized for its therapeutic qualities. Flavonoids, tannins, saponins, alkaloids, and other bioactive substances are abundant in the plant and contribute to its wide range of pharmacological actions, which include anti-inflammatory, hepatoprotective, antioxidant, and antibacterial properties. The plant's leaves, fruits, and roots have all been utilized historically in folk medicine to cure conditions like rheumatism, asthma, and digestive issues. Because of its high vitamin C and phenolic component content, recent research has shown its promise in medicinal and nutraceutical uses. The phytochemistry, pharmacological characteristics, and possible uses are examined in this review.

Keywords: *Phyllanthus acidus*, pharmacological products, phytochemical compounds, traditional use.

1.INTRODUCTION

One of traditional medications that accepted by WHO is herbal medicines. Herbal medicines usually use in developing countries for primary health care to treat various diseases based on long historical use of the herbal medicines itself. The term herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products, which contain as active ingredients parts of plants, or other plant materials, or combinations^[1]. *Phyllanthus acidus* (L.) Skeels or Otahei gooseberry is one of the Phyllanthaceae family. We know it as Cermai in Indonesia. *P. acidus* is one of the plants for traditional medicine. All of part of plant from *Phyllanthus acidus* has known have pharmacology affect^[2]. Phytochemical studies on the genus *Phyllanthus*, revealed the presence of lignin, terpenes, sterols, polyphenolic compounds, tannins, flavonoids, glycosides and. Biological investigations have also shown antihepatotoxic, antidiabetic, antioxidant, diuretic, anticancer, antimicrobial and anti-inflammatory properties^[3]. The leaves of *P. acidus* was empirical used for expectorant, reduced the body weight, treatment of nausea and stomatitis aphthosa^[4]. The root bark of *Phyllanthus acidus* has efficacy for asthma and skin diseases. Ceremai seeds has a effect for treatment of constipation. The ethanol extract of ceremai fruit had antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*. In India, ceremai is used as a therapy for rheumatism, bronchitis, respiratory diseases, liver disease, diabetes, and gonorrhea. Fruits of *Phyllanthus acidus* is widely used as an astringent, roots and seeds are used as cathartics, leaves and roots are used as an antidote and fever reducer^[5]. The extract of *Phyllanthus acidus* has pharmacology effect as anti-inflammatory and analgesic and has effectiveness as an antioxidant^[6-8]. The leaves are effectively used as antihypertensives^[9] and anticholesterol^[10].



2. BOTANICAL DISTRIBUTION

P. acidus is a tropical and subtropical species that originated from Madagascar and distributed to the Caribbean in 1793 when William Bligh brought the plant from Timor to Jamaica ^[11]. It is now found in the Caribbean region, Central and South America, and throughout Asia ^[12]. According to Eduardo Quisumbing, the plant was introduced and cultivated throughout the Philippines in prehistoric times ^[13]. It spread across the Indian Ocean to Reunion and Mauritius, and crossed the Pacific to Hawaii. *P. acidus* is commonly grown in the farms of Guam, Malaysia, Indonesia, India, Vietnam, and Laos. It is also found in Cambodia, Thailand, Puerto Rico and Cuba, USA, Jamaica, Northern Philippines, Grenada, Hawaii, southern parts of Texas, Florida, Ecuador, El Salvador, Mexico, Colombia, Venezuela, Surinam, Peru and Brazil. ^[11;14-16]



[17]

2.1 DESCRIPTION

The *Phyllanthus acidus* tree can reach a height of 15 m and play an intermediary between a shrub and tree. It bears a bushy crown is composed of thickish, hard branches and long twigs, at the end of which are clusters of deciduous. Branches with alternate leaves, tightly wrapped around the branch, distal, stipulate, coriaceous, acute to acuminate at the apex, rounded or broadly wedge-shaped at the base, with lanceolate stipules 3-8 mm long and 1-3.5 mm wide. Flowers are hermaphrodites (bears male and female). Found in clusters, small and pinkish, 5-to-12.5-cm long, found at the leafless section of the main branch towards the upper part. Fruits are edible, pale yellowish-green color and oblate, towards maturity pale yellow or white, waxy, crisp and juicy, and very sour with 6 to 8 lobes, and seen in densely clustered. At the center, one stone type of seed is found consisting of 4 to 6 seeds ^[18,19].

2.2 SYSTEMATIC STATUS OF THE PLANT ^[20]

Kingdom: Plantae

Division: Spermatophyta

Subdivision: Angiosperma



Class: Dicotyledonae

Order: Malpighiales

Family: Phyllanthaceae

Genus: Phyllanthus

Species: acidus

2.3 VERNACULAR NAME ^[20]

LANGUAGE	NAME
ENGLISH	Star gooseberry, Country gooseberry, Otaheite gooseberry
HINDI	Harpharevadi, Lavali, Harpharauri
BENGALI	Noyal, Harphal, Orboroi, Noyar, Loboni, Hariful
MARATHI	Rayaval, Harpharori
GUJARATI	Ghati Aavla
TAMIL	Arinelli, Aranelli, Arainellikai
TELUGU	Rachyusarika
KANNADA	Karinelli
KONKANI	Rajamvali
MANIPURI	Gihori
URDU	Harfarauri
SPANISH	Grosellero
FRENCH	Cerisier de Tahiti

3. ETHNOMEDICINE

It is essential to briefly explore the ethnomedicinal use of this herb to establish its historical significance. The fruit of *Phyllanthus acidus* is somewhat bitter, aromatic, pungent, and sour and enhances appetite. In Ayurveda, it increases the “Vata, so it is useful for the treatment of bronchitis. It is useful in treatment for biliousness, urinary concentrations, and piles^[21]. It enhance the blood and serves as a liver tonic and blood purifier^[22]. It is also used to treat diabetes, relieve cough, and enhance memory^[23]. In India, the bark has minimal application as a tanning agent. The wood, known for its toughness and durability, is well-suited for crafting dishes and various other items^[24]. Roots are used as medication for psoriasis ^[25]while the root extract is utilized to manage asthma, relieving cough, and headache. Mucilaginous nature of the leaves makes it useful as demulcent in case of treatment of gonorrhoea^[11]. The sour, mature fruits are widely used in culinary applications. They are consumed fresh and also in cooking for its flavour The fruit is also processed into chutneys, pickles, and jams. Its juice is used to prepare cold beverages, while the fruit itself is utilized in vinegar production. Additionally, young leaves are eaten as vegetables in India, Thailand, and Indonesia^[26]. In the Philippines, a leaf decoction is used to treat urticaria, while the bark is employed for managing catarrh^[27].

4. PHARMACOLOGICAL ACTIVITIES

4.1 ANALGESIC

Hossain, et al (Feb 2016) reported the analgesic activity of *phyllanthus acidus*. An ethanolic extract of *phyllanthus acidus* was administered orally to swiss albino mice. The study reveals that *P. acidus* leaves extract possess significant analgesic activity. ^[28].

4.2 ANTIINFLAMMATORY

Hossain, et al (Feb 2016) reported the antiinflammatory activity for ethanolic leaf extract of *phyllanthus acidus* on carrageenan-induced in swiss albino mice. The paw edema in carrageenan-induced in swiss albino mice was considerably reduced by treating *P. acidus* extract when compared to untreated group ^[28].



4.3 DIURETIC EFFECT

Vikasari, et al (Oct 2014) reported the diuretic effect of *Phyllanthus acidus*. An ethanolic leaf extract was administered orally to female wistar rats. This extract accelerate urinary function in rats within 60 minutes. The ethanol extract of *P. acidus* leaf exhibited a significant diuretic effect compared to the control group [29].

4.4 CNS DEPRESSANT

Hossain, et al (Mar 2016) reported the CNS DEPRESSANT activity for ethanolic leaf extract of *phyllanthus acidus* in swiss albino mice. This extract was administered orally. *P. acidus* possess significant CNS depressant and it could be an excellent source for natural CNS depressant [30].

4.5 ANTI DIARRHOEAL

Hossain, et al (Mar 2016) reported the diuretic effect of *Phyllanthus acidus*. An ethanolic leaf extract was administered orally to swiss albino mice. This study reveals that this extract possess significantly anti diarrhoeal activity [30].

4.6 ANTIPYRETIC ACTIVITY

Hossain, et al (Mar 2016) reported the Antipyretic activity of *phyllanthus acidus*. An ethanolic leaf extract was administered subcutaneous to swiss albino mice. The ethanol extract of *P. acidus* leaf exhibited a significant antipyretic effect [30].

4.7 HEPATOPROTECTIVE

Jain, et al (May 2011) reported the hepatoprotective activity of *Phyllanthus acidus*. An ethanolic and aqueous extracts on acetaminophen (APAP) and thioacetamide (TAA) induced liver toxicity in wistar rat. The extract was administered orally for period of 7 days. The study indicates that the aqueous extract of *P. acidus* leaves exhibits significant hepatoprotective activity against APAP and TAA-induced hepatotoxicity [31].

4.8 CYTOTOXIC AND ANTITUMOR

Gopinath, et al (April 2015) reported the cytotoxic and antitumor activities for ethyl acetate leaf extract of *Phyllanthus acidus* in swiss albino mice which was administered orally. In vitro Cytotoxicity assay was determined in DLA and Human cancer cell line. The result reveals that this extract exhibited significant cytotoxic effect to DLA in trypan blue exclusion method, human cancer cell line in MTT assay and antitumor activity in DLA induced solid tumor models in a dose dependent manner. [32].

4.9 TERATOGENICITY

Suryani, et al (2022) reported the teratogenicity of *Phyllanthus Acidus*. An ethanolic extract (EEPA) was performed in Pregnant Wistar Rats. The extract was given orally between the 6th and 15th days of pregnancy, during the organogenesis phase of fetal growth. The results reveal that this extract has no teratogenic effect because it does not cause abnormalities physical of the fetus [33].

4.10 IMMUNOMODULATORY

Nurfadhilah, et al (Mar 2022) reported the Immunomodulatory Effects of *Phyllanthus acidus*. An Ethanol Extract was administered orally until 14th day in Male Wistar Rats. This report the *P. acidus* extract had immunomodulatory effects and its potential to be developed as immunomodulator agent [34].

4.11 TOXICITY AND ORAL GLUCOSE TOLERANCE TEST

Chaimum-aom, et al (Nov 2016) reported the Toxicity and oral glucose tolerance test for ethanolic extract of *Phyllanthus acidus* (PAE) in male albino wistar rats. The animals are administered with the extract for 14 days. The result concluded that the PAE are practically non-toxic at a lower dose [35].



4.12 NEUROPROTECTIVE

Uddin, et al (Jun 2016) reported the Neuroprotective effect of *Phyllanthus acidus* fruit. A methanolic extract of *P. acidus* (MEPA) was administered in swiss albino male rat orally. As a result, this plant extract holds potential for improving learning, memory, antioxidant capacity, and anti-acetylcholinesterase activity, making it a promising candidate for neurodegenerative disorders such as Alzheimer's disease^[36].

4.13 ANTIOXIDANT

Shilali, et al (Jun 2014) reported the antioxidant activity of *Phyllanthus acidus* bark. The ethanolic extract of bark was administered orally for 7 days in wistar strain albino rat. The report demonstrated that *P. acidus* has antioxidant and protective activity^[37].

4.14 TOXICITY STUDIES

Bambang, et la (Oct 2019) reported the toxicity studies of *P. acidus*. An ethanolic extract of *P. acidus* leaves was determined through subchronic toxicity assay in wistar rat. The animals are administered sub chronic for 90 days. The results of the study revealed that *P. acidus* ethanol extract is relatively safe on sub chronic administration^[38].

5. CONCLUSION

Phyllanthus acidus has demonstrated a broad spectrum of pharmacological activities. It has been used in traditional medicine for its anti-inflammatory, hepatoprotective, antioxidant, antibacterial, analgesic, and neuroprotective effects. However, its safety profile has been established through subchronic toxicity studies, and further research is needed to fully explore its therapeutic potential, optimize its applications, and establish standardized dosages for clinical use.

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