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A Comprehensive Review on *Phyllanthus acidus*

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Abstract:

Belonging to the family Phyllanthaceae, the deciduous fruit-bearing tree *Phyllanthus acidus* (L.) Skeels goes by many names, including Otaheite gooseberry and star gooseberry. Originating in tropical regions, it is cultivated for its medicinal properties and popular for its tangy, tasty fruits. The abundance of bioactive chemicals in the plant, such as flavonoids, tannins, saponins, alkaloids, and others, gives it a broad spectrum of pharmacological effects. These actions include anti-inflammatory, hepatoprotective, antioxidant, and antibacterial capabilities. Traditional medicine practitioners have long relied on this plant's leaves, fruits, and roots to treat a wide range of ailments, including asthma, gastrointestinal problems, and rheumatism. Its potential medical and nutraceutical applications have been highlighted by recent studies due to its high vitamin C and phenolic component concentration. Phytochemical properties, pharmacological features, and potential applications are all included in this overview.

Keywords: *Phyllanthus acidus*, Herbs, phytochemical compounds, traditional use.

Introduction:

In terms of traditional medicine, the World Health Organization recognizes herbal remedies. Because of their lengthy history of usage, herbal medicines are often the first line of defense against a wide range of ailments in underdeveloped nations' primary health care systems. Herbal medicines include a wide range of substances that contain plant parts, other plant components, or a combination of these, as active agents. These include herbs, herbal materials, herbal preparations, and completed herbal products [1].A member of the Phyllanthaceae family, the *Phyllanthus acidus* (L.) Skeels is also known as the Otahei gooseberry. The Indonesian name for it is Cermai. One of the plants used for traditional medicine is *Phyllanthus acidus*. *Phyllanthus acidus*, the plant, in its whole or in part, is known to have pharmacological effects [2].The phytochemical analysis of plants belonging to the Phyllanthus genus has uncovered a number of interesting substances, including lignin, terpenes, sterols, tannins, flavonoids, glycosides, and polyphenolic compounds. Research in the biological realm has also shown its anti-inflammatory, anticancer, antibacterial, antioxidant, diuretic, and antidiabetic effects [3].Empirical uses for *Phyllanthus acids* leaves include

expectorant, weight loss, nausea therapy, and stomatitis aphtosa [4]. *Phyllanthus acidus* root bark is effective in treating skin disorders and asthma. When used as a remedy, ceremai seeds may ease constipation. Antibacterial activity against Staphylococcus aureus and Escherichia coli was observed in the ethanol extract of ceremai fruit. Traditional Indian medicine uses ceremai to treat a variety of conditions, including rheumatism, bronchitis, respiratory illnesses, diabetes, liver disease, and gonorrhea. The astringent properties of *Phyllanthus acidus* fruits, cathartic properties of the roots and seeds, antidote properties of the leaves and roots, and fever reducer properties of the fruit all make this plant useful [5]. There are pharmacological effects of *Phyllanthus acidus* extract as analgesics, anti-inflammatory, and antioxidant [6-8]. The leaves have powerful antihypertensive and anticholesterol properties [9,

BOTANICAL DISTRIBUTION

Originating in Madagascar, *Phyllanthus acidus* spread to the Caribbean in 1793 when planter William Bligh transported it from Timor to Jamaica [11]. Currently, it may be found all throughout Asia, Central and South America, and the Caribbean [12]. The plant was brought to the Philippines in ancient times and grown all across the country, according to Eduardo Quisumbing [13]. It began in the Indian Ocean and made its way to Mauritius and Reunion before making its way across the Pacific to Hawaii. Farms in Guam, Malaysia, Indonesia, Vietnam, and Laos often cultivate *Phyllanthus acidus*. This plant may also be found in the following countries: Cambodia, Thailand, Cuba, Puerto Rico, Jamaica, the northern Philippines, Grenada, Hawaii, Florida, Ecuador, El Salvador, Mexico, Colombia, Venezuela, Surinam, Peru, and Brazil. It is also found in the southern regions of Texas and Ecuador [11–16]

DESCRIPTION

Being both a shrub and a tree in one, the *Phyllanthus acidus* tree may reach a height of 15 meters. The thick, rigid branches and long twigs that make up its bushy crown finish in clusters of deciduous trees. Alternate leaves tightly wrap around the branch, while the leaves themselves are coriaceous, lanceolate, and 3-8 mm long and 1-3.5 mm wide. The leaves are acute to acuminate at the apex and rounded to widely wedge-shaped at the base. A flower may be both male and female, a trait known as hermaphrodites. Towards the top of the main branch, in the leafless area, you may see clusters of tiny, pinkish flowers that are 5 to 12.5 cm long. The fruits are edible, appearing in thick clusters, and have a light yellowish-green tint with an oblate shape. As they ripen, they become waxy, crisp, juicy, and quite sour. The focal point is a single seed type, the stone type, which contains four or six seeds [18,19].

SYSTEMATIC STATUS OF THE PLANT [20]

Kingdom: Plantae Division: Spermatophyta
Subdivision: Angiosperma
Class: Dicotyledonae Order: Malpighiales
Family: Phyllanthaceae Genus: Phyllanthus
Species: acidus

Table 1: 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	Rachyusarike
KANNADA	Karinelli
KONKANI	Rajamvali
MANIPURI	Gihori
URDU	Harfarauri
SPANISH	Grosellero
FRENCH	Cerisier de Tahiti

ETHNOMEDICINE

In order to prove the historical relevance of this plant, it is needed to briefly study its ethnomedicinal usage. *Phyllanthus acidus* is a plant that produces a fragrant, spicy, sour, and somewhat bitter fruit that stimulates hunger. It is beneficial for the treatment of bronchitis in Ayurveda since it enhances Vata. Biliousness, urine concentrations, and piles may all benefit from its usage in treatment[21]. It improves circulation, detoxifies the blood, and tonics the liver [22]. Diabetes, cough, and memory loss are among of its other medical uses [23].The bark's tanning agent use is quite limited in India. The wood is great for making dishes and other things because of its resilience and longevity [24].Asthma, cough, and headache may all be managed with the use of root extract, and the roots themselves can be used to treat psoriasis [25]. The mucilaginous properties of the leaves make them a good demulcent for gonorrhea therapy [11]. The ripe, acidic fruits have many uses in the kitchen. They are enjoyed both raw and cooked for their flavor. Jams, pickles, and chutneys are some of the other products made from this fruit. Cold drinks are made

using its juice, and vinegar is made from the fruit itself. The young leaves are also used in Thailand, Indonesia, and India as a vegetable [26]. Urticaria is treated with a leaf decoction in the Philippines, while catarrh is managed with bark [27].

PHARMACOLOGICAL ACTIVITIES

ANALGESIC

The analgesic effect of *Phyllanthus acidus* was reported by Hossain et al. in February 2016. The swiss albino mice were given an oral dose of an ethanolic *Phyllanthus acidus* extract. The research found that the extract of *Phyllanthus acidus* leaves had a strong analgesic effect. [28].

ANTIINFLAMMATORY

The anti-inflammatory effects of an ethanolic *Phyllanthus acidus* leaf extract on carrageenan-induced swiss albino mice were documented by Hossain et al. in February 2016. When compared to the control group, the *Phyllanthus acidus* extract significantly reduced the paw edema in carrageenan-induced Swiss albino mice [28].

DIURETIC EFFECT

The diuretic action of *Phyllanthus acidus* was reported by Vikasari et al. in October 2014. The female wistar rats were given an oral dose of an ethanolic extract of the leaves. Within 60 minutes, this extract speeds up the urine function in rats. In contrast to the placebo group, those given an ethanol extract of *Phyllanthus acidus* leaves showed a substantial increase in urine output [29].

CNS DEPRESSANT

Hossain et al. reported that an ethanolic leaf extract of *Phyllanthus acidus* has central nervous system depressant effects in swiss albino mice. The patient was given this extract orally. It is possible that *Phyllanthus acidus*, which contains strong central nervous system depressants, is a great place to get natural CNS depressants [30].

ANTI DIARRHOEAL

The diuretic action of *Phyllanthus acidus* was reported by Hossain et al. The swiss albino mice were given an oral dose of an ethanolic extract of the leaves. According to this research, this extract has strong anti-diarrheal properties [30].

ANTIPYRETIC ACTIVITY

The antipyretic effect of *Phyllanthus acidus* was reported by Hossain et al. in March 2016. Swiss albino mice were given a subcutaneous injection of an ethanolic extract of leaves. There was a significant reduction in body temperature when an ethanol extract of *Phyllanthus acidus* leaves was used [30].

HEPATOPROTECTIVE

The hepatoprotective effect of *Phyllanthus acidus* was reported by Jain et al. in May 2011. Acetaminophen (APAP) and thioacetamide (TAA) were tested for their ability to produce liver damage in wistar rats using ethanolic and aqueous extracts. Over the course of seven days, the extract was taken orally. The investigation found that the hepatoprotective effects of the aqueous *Phyllanthus acidus* leaf extract against APAP and TAA-induced liver damage were considerable [31].

CYTOTOXIC AND ANTITUMOR

Oral administration of ethyl acetate leaf extract of *Phyllanthus acidus* exhibited cytotoxic and antitumor effects in swiss albino mice, as reported by Gopinath et al. (April 2015). The cytotoxicity test was conducted in a controlled environment using human cancer cell lines and DLA. This extract showed a dose-dependent anticancer impact in solid tumor models produced by DLA, as well as a notable cytotoxic effect on human cancer cells in the MTT test and the trypan blue exclusion technique. [32].

TERATOGENICITY

The teratogenicity of *Phyllanthus acidus* was described by Suryani et al. (2022). Wistar rats who were pregnant had an

ethanolic extract (EEPA) administered to them. Oral administration of the extract occurred throughout the organogenesis period of foetal development, which began at day 6 and continued until day 15. Since it does not induce any physical defects in the embryo, the findings show that this extract does not have any teratogenic impact [33].

IMMUNOMODULATORY

An article detailing the immunomodulatory effects of *Phyllanthus acidus* was published in March 2022 by Nurfadhilah et al. Oral administration of an ethanol extract was continued in male Wistar rats until the fourteenth day. According to this study, the *Phyllanthus acidus* extract exhibited immunomodulatory actions and showed promise as a future drug in this field [34].

TOXICITY AND ORAL GLUCOSE TOLERANCE TEST

The toxicity and oral glucose tolerance test for *Phyllanthus acidus* ethanolic extract (PAE) in male albino wistar rats were reported by Chaimum-aom et al. in November 2016. The extract is given to the animals for a duration of 14 days. The results showed that at lower doses, the PAE was basically non-toxic [35].

NEUROPROTECTIVE

Neuroprotective effects of *Phyllanthus acidus* fruit were documented by Uddin et al. in June 2016. The swiss albino male rats were given an oral dose of a methanolic extract of *Phyllanthus acidus* (MEPA). This plant extract shows promise as a treatment for neurological diseases like Alzheimer's because of its antioxidant capacity, anti-acetylcholinesterase action, and ability to improve learning and memory [36].

ANTIOXIDANT

The antioxidant activity of *Phyllanthus acidus* bark was reported by Shilali et al. in June 2014. The wistar breed albino rat was given an oral dose of the bark's ethanolic extract for seven days. According to the study, *Phyllanthus acidus* exhibits preventive and antioxidant properties [37].

TOXICITY STUDIES

A study on *Phyllanthus acidus*'s toxicity was published in October 2019 by Bambang et al. The subchronic toxicity test in wistar rats was used to investigate the efficacy of an ethanolic *Phyllanthus acidus* leaf extract. The animals are given a subchronic dose for a duration of 90 days. Studies have shown that subchronic administration of ethanol extracts from *Phyllanthus acidus* is generally safe [38].

CONCLUSION

Phyllanthus acidus has shown a wide range of pharmacological effects. The traditional medical community has long recognized its many beneficial properties, including those of analgesic, antioxidant, antibacterial, hepatoprotective, and neuroprotective. Additional study is necessary to thoroughly investigate its therapeutic potential, refine its uses, and create standardized doses for clinical usage. Subchronic toxicity studies have proven its safety profile.

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