

**PHYLLANTHUS ACIDUS: A BRIEF REVIEW****Vaishnavi T.*, Ashoka Shenoy M., Karunakar Hegde and Shabaraya A. R.**

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ABSTRACT

Phyllanthus acidus is a fruit plant from Indonesia, commonly known as gooseberry, which belongs to the Euphorbiaceae family. It is rich in phyto-constituents such as ascorbic acid, gallic acid, tartaric acid, tannin, saponin, phytosterols, etc. It has been shown to have a series of pharmacological actions such as antioxidant, lipid lowering, anti-asthmatic, hepatoprotective, anticancer, antibacterial, etc. Most of these species used in India have a useful role in Ayurveda to treat digestive, respiratory and skin diseases. The main role of this review is to accumulate and organize articles on *Phyllanthus acidus* and its proven pharmacological action and mechanism of action.

KEYWORDS: *Phyllanthus acidus*; antioxidant; hepatoprotective; analgesic; alzimmers; CNS depressant; antipyretic; anti-diarrheal.

INTRODUCTION

Natural plants have been used throughout human history for a variety of purposes. They are used both traditionally and in current scientific research. A large number of plants in the Euphorbiaceae family have been studied all over the world. It represents a wide range of secondary metabolites with antibacterial, antioxidant, lipid lowering, anticancer, hepatoprotective, hypoglycemic properties etc.

Phyllanthus acidus is one of the most important plants in the Euphorbiaceae family. This fruit bearing plant is found all over the Asia and transported to many other countries due to its medicinal properties. *Phyllanthus acidus* is rich in phyto-constituents and the plant is replanted for multiple uses, latex is known for its purgative and emetic activity, the bark is used to treat bronchial catarrh and is a common local treatment. The roots are used to relieve

asthma and also to treat psoriasis of the feet, a decoction of the leaves is applied to treat hives. Rather, the fruit is used as a laxative and the antioxidants present in the fruit have a hepatoprotective effect on the liver. The leaves have antitumor, antitussive, antiasthmatic, antiscorbutic and slimming properties.

Family: Euphorbiaceae

Kingdom: Plantae

Synonym: Starberry, Gooseberry.^[1]

Taxonomical position^[2]

Table 1.

Kingdom	Plantae
Division	Spermatophyta
Subdivision	Angiosperma
Class	Dicotyledonae
Order	Euphorbiales
Family	Euphorbiaceae
Genus	Phyllanthus
Species	acidus

Botanical description

The *Phyllanthus acidus* tree can reach 15 m in height. The tree has hard branches and long twigs. The tree is monoecious, glabrous and deciduous.



Fig. 1

Leaves

The leaves are tightly wrapped around the branch, distal, alternate, stipulate, with lanceolate stipules 3-8 mm long and 1-3.5 mm wide, coriaceous, acute to acuminate at the apex, rounded or broadly wedge-shaped at the base.

**Fig. 2****Flowers**

Flowers are hermaphrodite. In dense racemes that forms thin, glabrous, emerging along the stem and branches, The male flowers are tiny and female flowers very few pedicellate. Flower is 5-12.5c.m long with reddish color.

**Fig. 3****Fruits**

Eatable fruit having pale yellowish green color and are found in clusters. The fruits are juicy and having taste sweet, 2 cm in diameter, drupes, depressed to subspherical balls, smooth, 6-8 lobes, fleshy exocarp, crustacean endocarp.^[3,4]

**Fig. 4**

Phytoconstituent

Generally, the *phyllanthus acidus* plant contains different types of secondary metabolites like terpenoids, glycosides, tannins, flavanoids, alkaloids, saponins etc. The main constituent present in the *phyllanthus acidus* is phenolic compounds.^[5] The fruits are rich in ascorbic acid, tartaric acid and tannins. The bark of the root contains gallic acid, tannin, saponin, lupeol and a crystalline substance. The stem bark contains phytosterols other than lupeol.

Traditional uses

Different parts of *phyllanthus acidus* have been used in traditional Indian system of medicine for the treatment of broad spectrum of disease. India, Asia, Caribbean region, and Central and South America are familiar with the plant to treat diseases like respiratory disorder, rheumatism, asthma, anti-inflammatory, hepatic diseases, bronchitis and diabetes.^[6]

Pharmacological activities

Hepatoprotective activity

The hepatoprotective activity of the *Phyllanthus acidus* leaf extract and the fruit extract are proven by inducing hepatic toxicity in rats. The aqueous extract of the leaves of *phyllanthus acidus* has a significant hepatoprotective activity. *Phyllanthus acidus* leaves extract has shown its effect by lowering the elevated level of serum marker enzyme and lipid peroxide in rats poisoned with paracetamol and thioacetamide. The hepatotoxic agents like thioacetamide, acetaminophen and ccl_4 can induce the formation of reactive metabolites in liver cells and thereby, initiation of the generation of reactive oxygen species leads to liver cell damage and enhancement of enzymes such as alkaline phosphatase, alanine transaminase and aspartate transaminase. It also leads to depletion of serum proteins and increased bilirubin levels. The aqueous leaves extract and ethanolic fruit extract of *phyllanthus acidus* shows the presence of phenolic compounds, flavonoids, glycosides, proteins, amino acids, carbohydrates, etc. It has good antioxidant property and prevents liver cell damage and thus reduces enzyme leakage. The gallic acid and quercetin found in the extract are able to scavenge free radicals, which in turn reverse the toxic effects caused by free radicals.^[7,8]

Antioxidant activity

Antioxidants are substances that can inhibit oxidation. Generating reactive oxygen species or free radicals by oxidation can damage cells. *Phyllanthus acidus* has been proven for its antioxidant effect. *Phyllanthus* fruit methanolic extract has significant antioxidant and

reducing power. *P. acidus* is rich in polyphenolic compounds as well as flavonoids and shows potential antioxidants and free radical scavenging.^[9,10]

Antibacterial activity

The phyllanthus plant extract was found to have a narrow spectrum of antimicrobial activity. The plant extract is little effective against a number of bacteria, including, *Bacillus cereus*, *Staphylococcus aureus*, *Bacillus megaterium*, *Salmonella typhi*, *Escherichia coli*.^[10,11]

Alzhimers disease

Alzheimer's disease is a neurodegenerative disease characterized by loss of memory and cognition. It involves cerebral cortex damage and decreased cholinergic transmission. Oxidative damage can also cause neurodegenerative disorders. Md. Moniruzzaman *et al.* studied the choline esterase activity of methanolic fruit extract of *Phyllanthus acidus* (MEPA) by Ellman's method. There was a significant increase in inhibition of acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) with an increase in concentration of MEPA and the highest activity obtained at 1000µg/ml. It was proved that methanolic extract of *phyllanthus acidus* leaves is a very good antioxidant agent it can also reduce the acetylcholine degradation.^[12,13,14]

Hypoglycemic activity

Ethanollic extract of *Phyllanthus acidus* leaves has been shown to significantly reduce blood sugar. *P. acidus* shows effective blood sugar lowering activity at doses of 250, 500 and 1000 mg / kg, but more significantly at dose of 500 mg / kg compared to standard (glibenclamide) and control group in statistical analysis.^[15]

Analgesic and Anti- inflammatory effect

Ethanollic extract of *phyllanthus acidus* leaves has been shown to possess anti-inflammatory and analgesic effect when tested on Swiss albino mice. *P. acidus* leaf extract has significant analgesic and anti-inflammatory effect and the dose of 200 mg / kg body weight is more significant than 100 mg / kg body weight in all methods.^[16]

Antidiarrhoeal effect

The methanolic extract of pulp of *P. acidus* has been proven antidiarrhoeal activity against castor oil induced diarrhea. The experiment is performed at a dose of 200 and 400 mg / kg and compared with that of the control and standard group (loperamide). The data obtained

showed that the pulp extract showed significant anti-diarrheal activity at a dose of 200 mg / kg compared to the control group. The extract might exerts its anti-diarrheal action by inhibiting prostaglandin biosynthesis through anti-secretory mechanism.

CNS Depressant activity

In a study done by Md. Saddam Hossain et.al, the ethanolic extract of *P. acidus* leaves was reported to cause CNS depression. The phytochemical evaluation showed the presence of flavonoids, saponins, steroids and alkaloids in the plant. Flavonoids and neuroactive steroids act as ligands for GABA A receptors in the nervous system, leading to the hypothesis that these compounds might act as benzodiazepine-like molecules. Therefore, it can be considered that the plant extract can exert its action by enhancing GABAergic inhibition in the CNS by membrane hyperpolarization.

Antipyretic effect

Ethanolic extract of *phyllanthus acidus* leaves has shown an antipyretic effect against pyrexia caused by brewer's yeast in Swiss albino mice. The increase in prostaglandin is responsible for the pyrexia. *P.acidus* significantly reduces yeast-induced pyrexia. Thus, it can be said that *P. acidus* contains one or more pharmacologically active ingredients that interfere with the release of prostaglandins.^[17]

CONCLUSION

The plant *phyllanthus acidus* is a fruit bearing tropical plant. Many parts of this plant has been used in traditional system of medicine for treating various diseases. It has antibacterial, antiinflammatory, antipyretic, analgesic, anti- diarrhoeal, hepatoprotective, hypoglycemic, CNS depressant, choline esterase inhibiting activities etc. The plant contains various active constituent mostly flavanoids, terpenoids, phenolics, glycosides, tannins, steroids, alkaloids and saponins. Apart from these extensive researches has been done on this plant and proven to have many pharmacological activities.

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