BHOOMYAMALAKI (PHYLLANTHUS NIRURI)

HemRaj[1] Manju Saini[2]

[1]Principal and Professor, PG Department of Kayachikitsa,
Desh Bhagat Ayurvedic College and Hospital, Mandi Gobindgarh

[2]Manju Saini, Associate Professor, Govt. Ayurvedic College Patiala

Corresponding author: Dr. HemRaj, Principal and Professor, PG Department of Kayachikitsa,
Desh Bhagat Ayurvedic College and Hospital, Mandi Gobindgarh

ABSTRACT

Phyllanthus niruri Linn. belongs to plant family Euphorbiaceae and is found in tropical and subtropical countries of the world, including some regions of India. Phyllanthus niruri Linn. is a commonly used herbal drug in Ayurveda system of medicine in the treatment of various disease conditions as a single drug or as an ingredient of many compound formulations. In the present review, literary review of Ayurvedic classical plant Bhoomyamalaki has been described which encompasses its botanical description, synonyms, pharmacological activity, properties, therapeutic uses and recent researches on Phyllanthus niruri Linn. This may help the young scholars to know the effectiveness of Phyllanthus niruri Linn. in various disease conditions.

Keywords: Euphorbiaceae, Bhoomyamalaki, Udara Roga, Herbal drugs.

INTRODUCTION

Phyllanthus niruri Linn., belonging to the family Euphorbiaceae, is widely distributed in tropical and subtropical regions of the world, including various parts of India. In the Ayurvedic system of medicine, it is commonly known as Bhoomyamalaki and is extensively used either as a single drug or as a component of numerous compound formulations for the management of diverse disease conditions. The present review highlights the classical Ayurvedic references of Bhoomyamalaki, covering its botanical description, synonyms, pharmacological activities, properties, therapeutic applications, and recent research findings on Phyllanthus niruri Linn.. This comprehensive account is intended to provide valuable insights for young scholars and researchers into the therapeutic potential of this important medicinal plant.

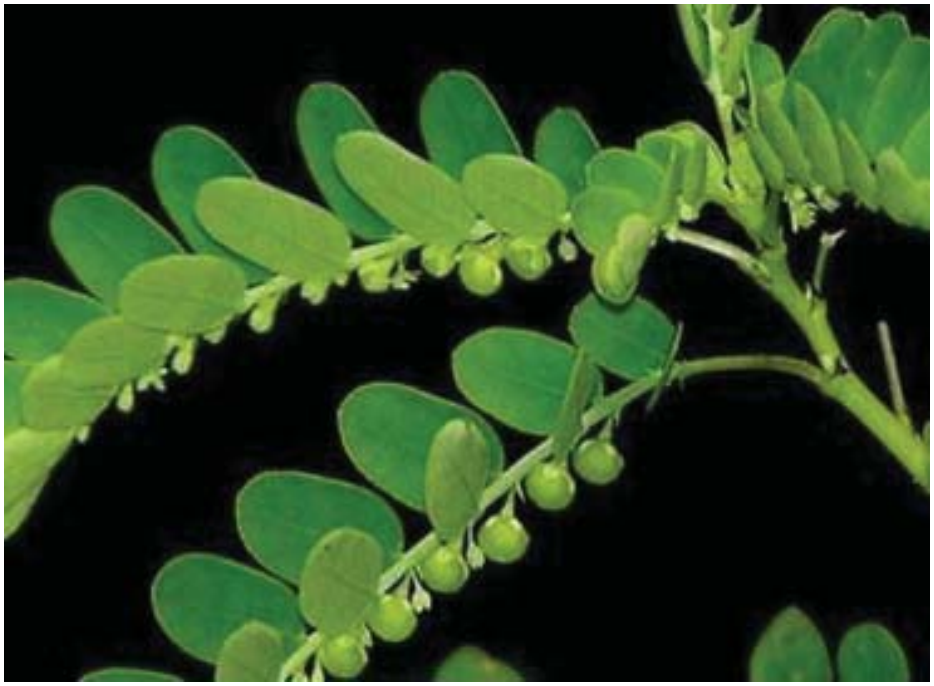
Phyllanthus niruri Linn. (family Euphorbiaceae) is an important medicinal plant in the Ayurvedic system of medicine. Herbal drugs have always played a significant role in the safe and effective management of diseases, and the use of plants for therapeutic purposes is as old as human civilisation itself. Among these, Bhoomyamalaki holds a prominent place. During the Samhitā Kāla (1000 B.C.–7th A.D.), Bhoomyamalaki was widely prescribed for a variety of disorders. In the Charaka Saṃhitā, it is mentioned under the name Tamalaki in Kāsahara Mahākāṣhāya, Śvāśhara Mahākāṣhāya and Madhura Skandha, and recommended either as a single drug or in compound formulations for the management of conditions such as Śvāsa (dyspnoea), Kāsa (cough), Hikka (hiccup), Pāṇḍu (anaemia), Unmāda (psychosis), Apasmāra (epilepsy) and Vātarakta (gout). In the Suśruta Saṃhitā it appears in preparations like Pippallayādi Ghṛita and Tāliśādi Ghṛita for the treatment of Jvara (fever), Kāsa (cough), Udara Roga (abdominal disorders) and Śvāsa Roga (respiratory disorders). Aṣṭāṅga Hṛidaya records Bhoomyamalaki in Pippallyādi Ghṛita, Kaṇṭakārī Ghṛita and Amṛtaprāśa Ghṛita for conditions such as Jvara, Hālimaka (chronic malaria), Śvāsa, Kāsa, Hikka, Āruci (loss of appetite), Śaya (emaciation) and Vātarakta. Chakradatta mentions Bhoomyamalaki in the Netraroga chapter for Netra Abhiṣyanda (ophthalmic inflammation), while Yogaratnākara cites it in Prameha Cikitsā (management of urinary disorders/diabetes). Various Nighaṇṭus list Bhoomyamalaki under several synonyms, including Bhuiaamalaki, Tamalaki, Ajatā, Bahupatra, Bahuphala, Sukṣmaphala, Himālaya, Tāli, Śiva and Vitunnika.

Bhoomyamalaki in Nighantu.

S. no.	Nighantu	Written By	Bhoomyamalaki inVarga	Time Period
1	Dhanwangtri Nighantu	Mahendra Bhaugika	Chandanadi Varga	10th-12th A.D
2	Shodhal Nighantu	Shodal	Chandanadi Varga	12th A.D
3	Madhanpal Nighantu	Madhanpal	Abhayaadi Varga	14th A.D
4	Raj Nighantu	Narhari Pandit	Parpatadi Varga	15 &17th A.D
5	Kaideva Nighantu	Kaiyadeva	Aushadhi Varga	15th A.D
6	Bhavparkash Nighantu	Bhav Mishra	Guduchyadi Varga	16th A.D
7	Nighantu Adharsh	Bapalal Vaidya	Amalakadi Varga	19th A.D
8	Priya Nighantu	Priya Vrita Sharma	Shatapushpadi Varga	20th A.D

Botanical name: Phyllanthus niruri Linn.

Family: Euphorbiaceae



Bhoomyamalaki (Phyllanthus niruri Linn.).

Taxonomical position:

- Sanskrit - Bhoomyamalaki
- Latin - Phyllanthus niruri Linn.
- Species - Urinaria
- Genus - Phyllanthus
- Family - Euphorbiaceae
- Series - Unisexual
- Subclass - Monochlamydeae
- Class - Dicotyledonae
- Subdivision - Angiospermae
- Division - Spermatophyta
- Kingdom - Plantae

Botanical description of bhoomyamalaki[1]

The plant is annual herb, up to 60 cm height, erect. Flowers are whitish, greenish and yellowish axillary, male flowers are 1 -3, female solitary. Leaves elliptic-oblong, linear- oblong and districhous. Seeds 3-gonous, pale brown, longitudinally ribbed. Capsules depressed smooth, globes, scarcely lobed.

Geographical sources of Bhoomyamalaki[2]

The plant is found growing abundantly throughout India, mainly in the states of Maharashtra, Uttar Pradesh, Punjab, Bihar, Orissa, Andhra Pradesh and some parts of Madhya Pradesh, Karnataka, Bengal and also found in Sri Lanka.

Cultivation and Collection[3]

It grows well under tropical climatic conditions. However, very dry temperature or very low temperature conditions are not preferred. It can grow up to 700-800 meters height above the sea level, suitable temperature ranging from 25-400 C with average humidity and well distributed rainfall in the range of 40-50 cm is suitable. Bhuiamla grows in a variety of soils, preferably well drained rich organic and light textured soils. It also grows well on sandy loamy to calcareous soil. Soil pH should be alkaline to acidic. Even water logging soil does not show adverse effects on its growth. It is propagated well through seeds or by raising seedlings and transplanting. The plant matures within 3 -4 months. They are usually harvested after the rainy season is over, when the amount of green leaves is in abundance. Since, the active constituent is present in leaves, higher leaf mass is expected during harvesting, the whole plant is uprooted. The collected whole plants are cleared of external matter and are allowed to dry in shade. The fresh juice of plant is also used in medicine. Total yield of fresh herb per hectare is about 2-3 tonnes.

Phytochemistry[4]

Phyllanthus niruri Linn. plant shows significant activities on various diseases in many ways and it has been evaluated and analyzed for its chemical constituents. The reported constituents are as shown in the Table

S. No	Class	Compounds
01.	Alkaloid	4-Methoxy-nor-securinine, nirurin, ent-norsecurin
02	Benzenoid	Gallic acid, Corilagin
03.	Coumarin	Ellagic acid, ethyl brevifolin carboxylate
04	Flavonoid	Quercetin, rutin, astragalin, quercitrin,isoquercitrin, kaempferol-4-rhamnopyranoside, eridictyol-7-rhamnopyranoside, fisetin-4-O-glucoside nirurin
05	Lignin	Phyllanthin, hypophyllanthin, niranthin, nirtetralin, phyltetralin, hinokinin, isolintetralin
06.	Lipid	Ricinoleic acid
07.	Phytallate	Phyllester
08.	Sterol	Estradiol, ß-sitosterol, isopropyl-24-cholesterol
09.	Tannin	Geranin
10.	Triterpene	Lupeol acetate, lupeol, 3,7,11,15,19,23-hexamethyl- 2Z,6Z,10Z,14E,18E, 22E-tetracoshenen-1- ol, phyllanthenol, phyllanthenone, phyllantheol

Various species OF bhoomyamalaki:

S. no.	Species name of Bhoomyamalaki
1	Phyllanthus amarus
2	Phyllanthus ajmerianus
3	Phyllanthus fraternus
4	Phyllanthus kozhikodianus
5	Phyllanthus madeaspatensis
6	Phyllanthus rheedii
7	Phyllanthus rotundifolius
8	Phyllanthus sdeblis
9	Phyllanthus scabrifolius
10	Phyllanthus tenellus
11	Phyllanthus urinariya
12	Phyllanthus virgatius

Ayurvedic properties as per almost all ayurvedic treatises [6]

- Rasa: Tikta, Kashaya,Madhura
- Guna: Laghu, Ruksha
- Veerya: Sheeta
- Vipaka: Madhura
- Doshanghata: Kapha- Pitta Shamak

Dose

- Powder: 3 - 6 gm
- Juice: 10 - 20 ml

Parts used

Whole Plant

Actions and Uses[7]

- The plant and plant extract are used for treatment of a variety of diseases by folk and traditional medicinal practitioners. The Bhoomyamalaki plant is bitter, astringent, stomachic, deobstruent, antiseptic, diuretic and febrifuge. Fresh roots are beneficial in jaundice. They are taken with milk as a galactagogue. It is useful in gastric disorders such as Colic, Dysentery, Diarrhoea, Dyspepsia and Jaundice. Also in Dropsy, Anaemia, Ophthalmic disorders, Intermittent fever, diabetes, diseases of Meno-Metrorrhagia, diseases of the Urogenital system, wounds, ulcers and scabies. A decoction of leaves is used as a refrigerant for the scalp. Latex is applied to offensive sores and ulcers and with oil it is used in Opthalmia. Leaves and Roots are made into a poultice with rice water for Oedematous swellings and ulcers.

REPORTED PHARMACOLOGICAL ACTIVITIES:

Following pharmacological activities have been reported in different studies -

1. **Liver protective, Detoxification & Antioxidant activity**
   - The carbon tetrachloride and galactosamine induced cytotoxicity in rat hepatocytes can be decreased by the Phyllanthus niruri Linn. hexane extract. Phyllanthin and hypophyllanthin protects against the CCl4 induced cell lesions and GalN induced Hepato toxicity.[8]
   - Phyllanthus niruri Linn. can reduce Nimesulide induced hepatic damage. By measuring the levels of glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT) and alkaline phosphatase (ALP) in serum it was concluded that the levels of these enzymes are decreased in the extract treated group. By these observations intra peritoneal treatment was found to be more effective than oral administration and by combining this data we can conclude that P.niruri protects the liver from Nimesulide induced liver toxicity[9] & Oxidative stress.[10]
   - The over dose of paracetamol leads to hepatotoxicity same as by viral infection. The glutamic pyruvic transaminase (GPT) levels of serum were decreased in the Phyllanthus niruri. Linn treated group.[11] The serum glutamate pyruvate transaminase (SGPT) and

glutamate oxaloacetate transaminase (GOT) was decreased in the in vivo studies conducted in rats.[12] The ethanol extract and hexane extract were administered and the serum parameters (serum bilirubin, serum alkaline phosphatase, serum aspartate (AST), serum alanine transferase (ALT), hepatic reduced glutathione (GSH) were analysed and these parameters were controlled after the treatment with hexane extract and hence it was stated that Phyllanthus niruri. Linn can control the paracetamol induced hepatotoxicity.[13] Protein isolated from this plant was found to enhance cell viability against tertiary butyl hydroperoxide induced cytotoxicity and cell death and it protects hepatocytes against thioacetamide induced cytotoxicity. The extract prevents the alterations in GSH levels and it also reduces the lipid peroxidation induced by TAA. By the DPPH assay it was found that the isolated protein has radical scavenging activity. This protein protects the liver from the carbon tetrachloride induced hepatotoxicity and this can be measured by the liver enzymes and reduced levels of antioxidant enzymes.[14,15,and16]

- Alcohol is a toxin in higher doses and when it is associated with poly unsaturated fatty acids (PUFA) induces oxidative stress & hepatotoxicity. This can be efficiently reduced by P.niruri extract analyzed by the antioxidant potentials of liver enzymes and histopathological studies.[17]

1. **Lipid lowering activity**
   - The Phyllanthus niruri Linn. has the capacity to reduce the serum lipid levels. The extract is fed orally (250 mg/kg b.w) in hyperlipidemic rats, results followed by reducing lipid levels.[18]
   - Methanol extract of Phyllanthus niruri Linn. was tested against chlorpyrifos (CPF)- evoked erythrocyte fragility and lipo peroxidative changes in wistar rats and observed lipid per oxidative changes and protection from the chlorpyrifos induced erythrocyte fragility.[19]
2. **Antispasmodic, pain-relieving & Anti anti -inflammatory**[20]
   - The wound healing nature of Phyllanthus niruri Linn. has been evaluated by the healing of wounds by oral and topical administration. Phyllanthus niruri Linn. was proved to have a significant role in wound contraction and epithelialisation. When Dexamethasone (suppress the wound healing) suppressed rats were treated with the extract a significant increase in wound contraction was found by both oral and topical administration.
3. **Immuno-modulatory actions**
   - An arabinogalactan (AG) which was obtained from Phyllanthus niruri Linn. tea preparations was found to have immunological properties and is tested with peritoneal mice macrophages. The glycoside showed the same activity when subjected to acidic and neutral gastric conditions using human gastric fluids and aq.HCL solution.[21]
4. **Antiviral action (Hepatitis B)**
   - The plants of the Phyllanthus genus have been used for natural remedies for thousands of years in Asia. (Thyagarajan ET al.1988). Phyllanthus niruri Linn. has been used to inhibit the hepadna virus and it is extensively used to treat jaundice and hepatitis B virus.[22] The phyllanthus genus plants inhibit duck hepatitis B virus by inhibiting 50 % of DNA polymerase.[23]
   - Hepatitis B is the most prominent disease in the emerging era. Phyllanthus niruri Linn. extract can prevent Hepatitis B by binding to the endogenous DNA polymerase and even it can bind to the hepatitis B surface antigen in vitro. Woodchuck hepatitis virus (WHV) was tested against the extract in wood chucks (Marmota monax), it efficiently inhibited the woodchuck hepatitis virus (WHV) and elimination of both surface antigen and DNA polymerase activity was found.[24]
5. **Antimicrobial activity**
   - The extracts of Phyllanthus niruri Linn. and Piper beetle were tested against food borne & spoilage microorganisms. The ethanolic extracts of dried

Phyllanthus niruri Linn. inhibited the growth of microorganisms.[25]

- The antimicrobial activity of fermented Phyllanthus niruri Linn. by using lactobacillus was enhanced 80-170% when compared to the crude extract. The potency was increased by 49% when the extract was fermented with lactobacillus.[26]
- The methanol extract of P. niruri is strong against Bacillus pumillus, E. coli and Vibrio cholera at conc of 750µg/ml/disc. It is tested against standard drug chloramphenicol at conc 10µg/ml/disc and thus shows potential source of antimicrobial agent.[27]
- The Phyllanthus niruri Linn. extract of alkaloids were tested on rabbits infected with E.Coli. The results examined were found to have increased concentration of WBC, neutrophils, lymphocytes and hemoglobin.[28]

7. **HIV replication inhibition**

   The prominent human Immuno Virus replication is inhibited by the alkaloidal extract of Phyllanthus niruri Linn. and tested against virus induced MT-4 cells; it suppressed the activity in strains of HIV 1 cells. The REV (regulation of virion expression) is an HIV protein that regulates the transport of viral RNA to the cytoplasm and its basic domain is RRE (responsive element). The niruriside isolated from methanol extract of Phyllanthus niruri Linn. shows inhibitory activity against binding the REV protein to RRE RNA.[29]

8. **Anti malarial activity**

   Malaria is one of the most prominent health problems in tropical and subtropical countries. The herbal plants show antagonistic properties against malaria. Phyllanthus niruri Linn. and Mimosa pudica showed antiplasmodial activity, when feeded with ethanol extracts in albinomice.[30] Phyllanthus niruri Linn. ethanolic extract of one month old in vitro grown callus showed higher antiplasmodial activity than extract prepared from fresh apical stem extract.[31]

9. **Nematocidal activity**

   The two prenylated flavones are isolated from the hexane extract of Phyllanthus niruri Linn. Showed Nematocidal activity against two nematocides, Meloidogyne incognita and Rotylenchulus reniformis. The two compounds showed moderate Nematocidal activity against nematodes.[32]

10. **Anti ulcer activity**

    The acidic heteroxylan and another polysaccharide showed anti-ulcer activity. These compounds reduced the gastric lesions induced by 65% and 78% ethanol. Phyllanthus niruri Linn. proved to be efficient against peptic ulcers.[33]

11. **Antifertility activity**

    The antifertility activity of Phyllanthus niruri Linn. was tested on male albino rats; it shows a significant decrease in fructose levels of seminal fluids, sperm count, sperm motility and viability. It shows antifertility activity by decreasing the testosterone levels of the treated rats.[34]

12. **Antinociceptive activity**

    - The analgesic activity of Phyllanthus niruri Linn. is demonstrated against formalin induced nociception in mice. The hydro alcoholic extract of Phyllanthus niruri Linn. is given orally (25-200mg/kg) or intra peritoneally (1-30mg/kg) which causes dose related inhibition of capsaicin induced pain.[35,36]
    - The phyllanthus genus is having high potential level anti analgesic plants and isolated hydroalcoholic extracts of four new species of phyllanthus showed significant inhibition of acetic acid induced abdominal constrictions.[37,38]

13. **Anti Cancerous & Cellular protective actions**

    - Phyllanthus niruri Linn. has high potential to inhibit the growth and initiation of cancerous cells which were introduced into mouse skin cells with 7, 12 dimethyl Benz (a) anthracene (100µg/100ml acetone) and croton oil (1%).[39] And there is drastic increase in the catalase, reduced glutathione and protein levels in the skin. In albino mice the chemopreventive action of Phyllanthus niruri Linn. with DMBA induces skin papillomagenesis.[40]

14. **Action of kidney Stones & Uric acid**

    - Kidney stone is a common problem that accumulates

calcium oxalate crystals, and it includes urinary calculi formation, nucleation, growth, and aggregation of crystals. Phyllanthus niruri Linn. extract interferes in the growth and aggregation of calcium oxalate [CaOx] crystals in the calculi. The extract inhibits CaOx crystal aggregation in the early stages of stone formation in the urine samples of male Wister rats. It is advisable to treat stone formation in the early stages.[41]

- The CaOx metastable limit was decreased by the treatment of Phyllanthus niruri Linn. extract and it can also deprive the CaOx crystals and formation of nucleation.[42] The extract has the ability to prevent the growth of calculi and also change the shape and texture of the calculi. When treated on the preformed calculi it can form a matrix like material on its surface and it can modify the appearance and texture of the calculus.[44] The extract is also administered in hyper calciuric patients; it can decrease the urinary calcium levels.[43] and also reduces the excess uric acid in hyperuricemic people by the lignans with uricosuric action in the extract.[45]

CONCLUSIONS:

Phyllanthus niruri Linn. belongs to the Euphorbiaceae family is regarded by traditional medicinal practitioners as a valuable medicinal plant. It is a small herb having a wide range of medicinal properties and is used widely across the world as well. Various important phytochemicals have been isolated and identified from the plant such as Lignans, Phyllanthin, Hypophyllanthin, Flavonoids, Glycosides, Tannins, Alkaloids, Ellagitannins, Triterpenes, Phenylpropanoids, Steroids, Ricinolic acid, Niruriside & Phyltetralin. Phyllanthus niruri Linn. is used as a folk medicine for gallbladder stones, anaemia, jaundice, hyperglycemia, to relieve hepatotoxicity caused by drugs, viral, bacterial infections, liver related other diseases such as liver cancer, as diuretic for treating kidney stones. It also shows anti inflammatory, anti tumor, antinociceptive and anti oxidant properties. The available scientific reports indicate that Phyllanthus niruri Linn. can be the source of next generation of drugs to treat cancer, kidney, liver diseases, metabolic diseases like anaemia, Diabetes mellitus etc.

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