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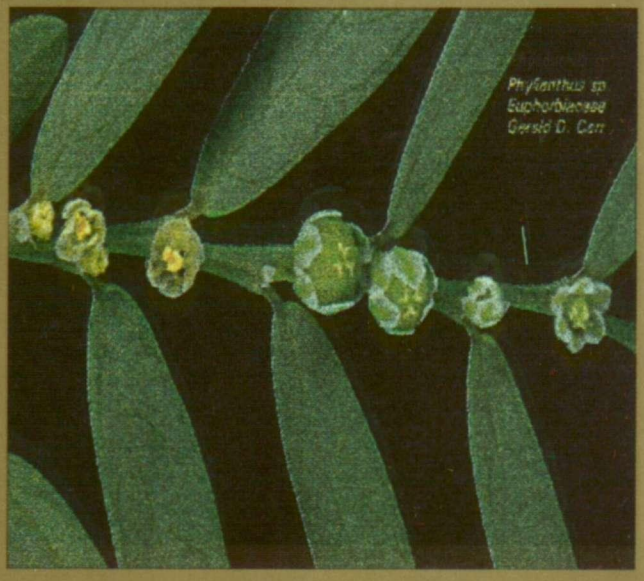

PITAWAKKA

(*Phyllanthus debilis*)

Information Services Centre
Industrial Technology Institute
(Successor to CISIR)
Colombo, Sri Lanka

Medicinal and Aromatic Plant Series, No. 10

Pitawakka

- a literature survey –

Compiled by :
Purnima Jayasinha

Supervised by :
Dilmani Warnasuriya
and
Harshani Dissanayake

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Contents

Phyllanthus debilis

1.0 INTRODUCTION

Phyllanthus debilis is an important medicinal herb popularly known as 'Pitawakka' in Sinhala. In earlier taxonomy it was known as *Phyllanthus niruri* Linn. and this classification is still in use. However some of the published literature, scientists have considered these as two different species. According to D.M.A. Jayaweera's Medicinal Plants (part II), both names are refer and it is considered in this monograph as well. *Phyllanthus amarus*, which has very similar phytochemical features is also considered as same the species by some scientists.

Pitawakka has been used in ayurvedic system of medicine to treat jaundice, gallstone and kidney stones for many years. The Spanish name `Chanca Piedra' means `stone breaker' or `shatter stone' as it has used for generations by indigenous people of the Amazon to treat gallstones and kidney stones.

2.0 BOTANY [22]

2.1 TAXONOMY

Pitawakka belongs to genus *Phyllanthus*, which contains over 600 species of shrubs, trees and annual or biennial herbs distributed throughout the tropical and subtropical regions of both hemispheres.

Family : *Euphorbiaceae*
Genus : *Phyllanthus*
Species : *debilis*

Botanical names
Phyllanthus niruri Linn.; *Phyllanthus carolianus* Blanco.: *Phyllanthus kirganelia* Blanco; *Phylanthus pumilus* Muell. Arg.; *Nymphanthus niruri* Lour.; *Kirganelia pumila* Blanco

Other names

Sinhala	: Pitawakka; Bimnalli
Tamil	: Kilanelli; Kilkkaynelli
Hindi	: Bhonyaabali; Bhuinanvalah; Jaramla
Sanskrit	: Adhyanda; Amala; Bahupatri; Bahupushpi; Bhumyamalaki

2.2 PLANT DESCRIPTION [22,48,75]

Phyllanthus debilis is an annual herb. It is about 30- 60 cm in height with an angular stem often branched at the base. Leaf bearing branchlets are slender and spreading. The leaves are simple, alternate, distchous, numerous and crowned. They are very shortly stalked, about 1.5- 3 cm long and 4.5- 5.5 mm broad and oblong oval.

The flowers are yellow in colour, unisexual, monoecious, apetalous, axillary, pedicilled and regular. Male flowers are very minute, 1.5 mm in diameter and often 2-3 together in the axis of lower leaves. The female flower is larger than male flowers, 2.5 mm across, solitary and axillary.
The fruit is 1.5- 2 mm long, depressed, globose, faintly 3-lobed, quite smooth, splitting into three.

3.0 HABITAT [22]

In Sri Lanka, it is a common weed in waste and cultivated grounds. Also occurs through-out the tropics including the Philippine Islands, except Australia. It is also found through-out the hotter parts of India and on the hills up to 30-35 m.

4.0 AGRONOMY [22]

4.1 SOIL AND CLIMATE

It grows widely during the rainy season in fallow land and in shade. It germinates readily in warm soil.

5.0 CHEMISTRY OF PLANT [2,4,9,10,14,15,17,18,24,34,38,39,41,58,60-64,69,71,75]

5.1 CHEMICAL CONSTITUENTS OF PLANT

Alkaloids

Allosecurunine
4-Hydroxysecurinine
4-Methoxy norsecurinine
4-Methoxy tetrahydrosecurinine
Norsecurinine
Securinine
Securinol B
Dihydrosecurinine
4-Methoxy dihydronorsecurinine
4-Methoxy securinine
Nirurine
2-Norsecurinine
Securinol A
Tetrahydrosecurinine

Lignans

Hinokinin
Hypophyllanthin
Nirphyllin
Nirtetrelin
Phyllnirurin
Seco-4-hydroxylintertralin
Triacontanal
Hydrxyniranthin
Isolintetralin
Nirtetralin
Phyllanthin
Phyltetralin
Seco-isolariciresinol trimethyl ether
Triacontanol

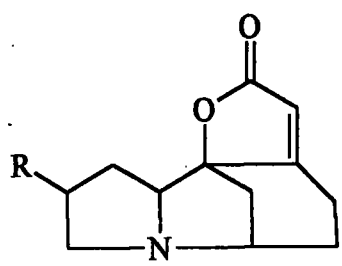
Flavanone and Flavanoids

Astragalin
Eriodictyol-7-rhamnopyranoside
Isoquercitin

Kaempferol-4'-rhamnopyranoside
Nirurin
Nirurinetin
Quercetin
Quercetin 3-O-β-D-glucopyranosyl (1-4)-α-L-rhamnopyranoside
Quercetin-heteroside
Quercetol
Quercitin
Rutin
3,5,7,4'-Tetrahydroxyflavone
3,5,7-Trihydroxyflavonal-4'-O-α-(-)-rhamnopyranoside
5,3',4'-Trihydroxyflavonone-7-O-α-(-)-rhamnopyranoside

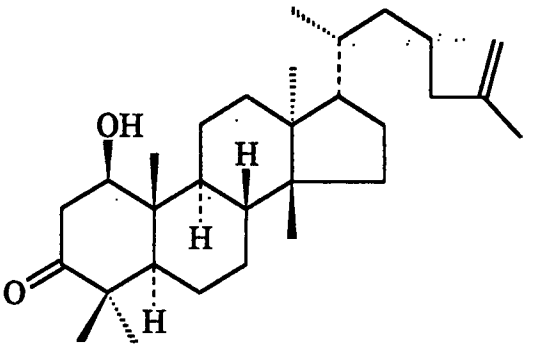
Triterpenes
3,7,11,15,19,23-Hexamethyl-2Z,6Z,10Z,14E,18E,22E-tetracosahexen-1-ol
Lup-20(29)-en-3β-ol
Lup-20(29)-en-3β-ol acetate
Lupeol
Phyllanthenol
Phyllanthenone
Phyllanthol

Sterols
Dotriacontanoic acid
24-Isopropylcholesterol
β-Sitosterol

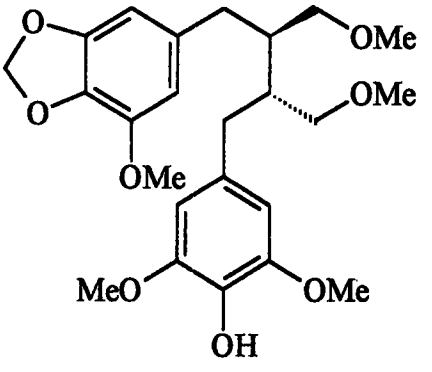


R = CH_3 : **4-Methoxy dihydro norsecurinine**

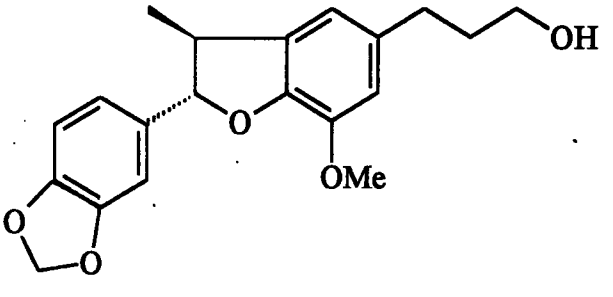
R = OH : **4-Hydroxy securinine**



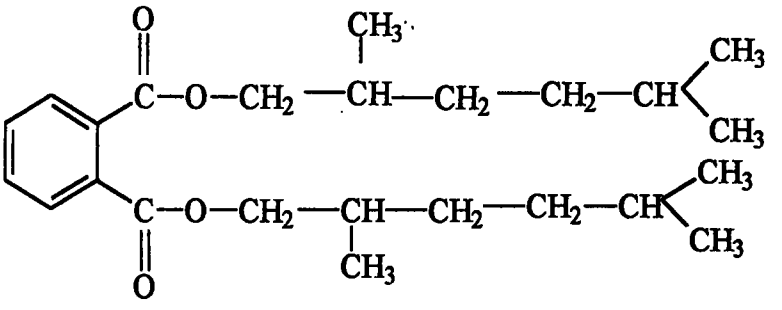
Phyllanthenol



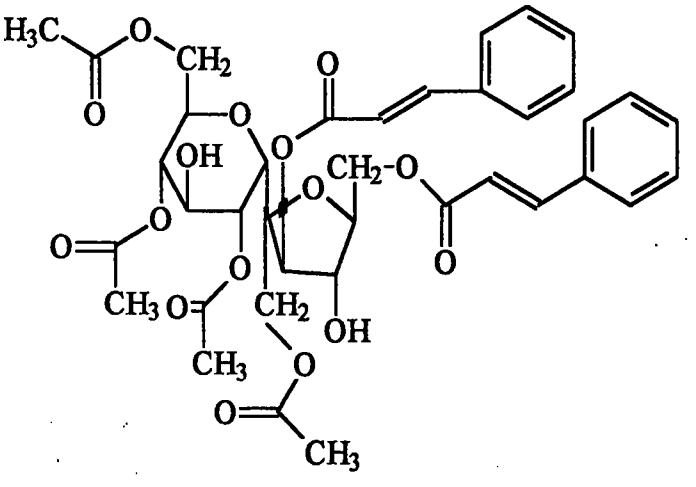
Nirphyllin



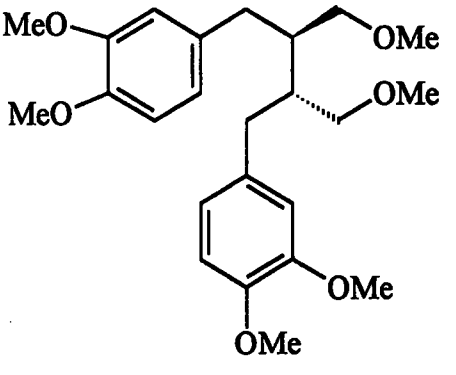
Phyllnirurin



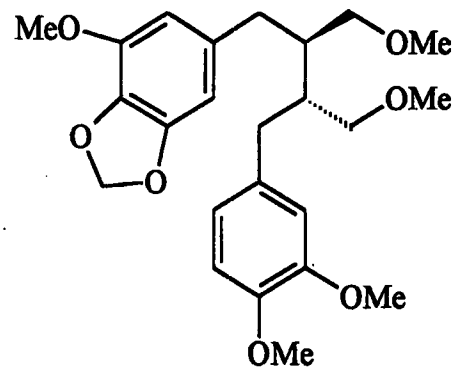
Phyllester



Niruriside



Phyllanthin



Hypophyllanthin

Figure 1. Chemical Constituents of *Phyllanthus niruri*

6.0 BIOLOGY AND HEALTH ASPECTS [3,13,16,18,21,23,27,29,31,43,44,46,53,59,69,71,75]

6.1 BIOLOGICAL ACTIVITY

Phyllanthus niruri is reported to be anodyne, apertif, anti bacterial, anti inflammatory, anti hepatotoxic, anti spasmodic, anti viral, carminative, choleretic, digestive, diuretic, emmenagogue, febrifuge, hepatotonic, hypoglycemic, hypotensive, immunostimulant, laxative, stomachic, tonic, vermifuge

In a research for anti-hepatotoxic activity, the lignans phyllanthin and hypophyllanthin have shown activity against CCl_4 and galactosamine induced cytotoxicity in primary cultured rat hepatocytes, where as triacontanal has prevented only galactosamine activity. Alcoholic extracts of roots and leaves of *Phyllanthus niruri* have shown hepatoprotective effect in experimental rats, where root extract was more effective than the leaf extract. In another study it was reported that *Phyllanthus niruri* have significant hepatoprotective action against CCl_4, paracetamol and alcohol induced liver damage.

On a study on biochemical effects on *Phylanthus niruri*, an ayurvedic drug for hepatitis, in rats, it was found there weren't significant alterations on *in vitro* tissue respiration and hepatic K+, Mg2+ and inorganic phosphorus content after feeding the drug for a period of 2 weeks. However the concentration of Na+ in the liver was elevated by 4 doses of the drug. It was also found that asparate and alanine transaminases and alkaline phosphate of serum and liver as well as liver microsomal glucose 6-β-phosphatate, ali-esterase and glucopyronyl transerase were unaffected by feeding aqueous extract of the drug.

An evaluation of the safety of *Phyllanthus niruri* as an antihepatitis B virus substance made in *in vitro* and *in vivo* studies using mice as the model and Vero cell line as the tissue culture system showed there was no mortality of the animal during the study period nor any mean weight loss or behavioral change.

The components which were extracted from *Phyllanthus niruri* by the use of methanol, optionally after being extracted by hexane and benzene, have been found to have *in vitro* hepatitis B virus – DNA polymerase inhibitory activity and hepatitis B surface antigen binding activity. Further more they can be used in the manufacture of a medicament for the treatment of hepatitis B virus.

The most recent research has revealed that antiviral activities of *Phyllanthus niruri* has extended to human immunodeficiency virus (HIV). It has been found, that reandusinic acid A, which was isolated as repandusinic acid A monosodium salt from aqueous extract of *Phyllanthus niruri* has showed activity against HIV reverse transcriptase. In a recent study it was found , that 'niruriside' was one of the constituents to show activity against HIV.

An aqueous extract of the leaves of *Phyllanthus niruri* has exhibited hypoglycaemic activity in normal and alloxan diabetic rabbits. In another study alcoholic extract of leaves at an oral dose of 250 mg/kg has produced a significant decrease in the blood glucose level of alloxan induced diabetic rabbits.

Ellagic acid, brevifolin carboxylic acid and ethyl brevifolin carboxylate which were isolated from an ethanolic extract of *Phyllanthus niruri* has shown aldose reductase (AR) inhibitory activity. Among them, ellagic acid has shown the highest inhibitory activity, being about 6 times more potent than quercitrin, which is a known natural inhibitor of AR.

The linans, phyllanthin, hypophyllanthin and nirtetralin from aerial parts *Phyllanthus niruri* was identified as non-peptidic endothelin antagonists. (Endothelin is a potent vascoconstrictor peptide which could be involved in the production of hypertention peptide)

6.2 ETHNOMEDICINE

Worldwide uses of *Phyllanthus niruri*

Country	Uses
Amazonia	Gallstones, Kidney Diseases, Kidney Stones
Bahamas	Aperitif, Cold, Constipation, Fever, Flu, Laxative, Stomach Ache, Typhoid
Brazil	Joint Ache, Antispasmodic, Bladder Diseases, Cystitis, Diabetes, Diuretic, Fever, Gallbladder Diseases, Gallstone, Hepatitis, Hydropsy, Kidney Trouble, Kidney Stones, Liver, Prostate and Urinary Diseases
Elsewhere	Blennorrhagia, Diabetes, Diarrhoea, Diuretic, Dropsy, Dysentery, Dyspepsia, Emmenagogue, Fever, Gallstone, Gonorrhea, Kidney Stones, Malaria, Tonic

Haiti	Stomach Ache, Carminative, Colic, Digestive, Diuretic, Fever, Malaria, Stomachic, Tenesmus
India	Anemia, Asthma, Bronchitis, Cough, Diuretic, Dysentery, Gonorrhea, Hepatitis, Jaundice, Thirst, Tuberculosis, Abdomen Tumor
Java	Cough, Gonorrhea, Stomachache
Malaya	Caterpillersting, Dermatosis, Diarrhoea, Diuretic, Itch, Miscarriage, Piscicide, Renosis, Syphilis, Vertigo
Marianas	Dysentery, Itch, Rectitis, Vaginitis
Peru	Diuretic, Hepatitis, Gallstone, Kidney Stones

Phyllanthus has been used in ayurvedic system of medicine for over 2,000 years and has a wide number of traditional uses.

In Sri Lanka, the juice of the plant is given as a diuretic in gonorrhea and the root along with other drugs for diarrhoea. The whole plant grounded to a paste is given with cow's milk for jaundice.

In India, whole plant is used as a diuretic in dropsical affections, gonorrhea and other troubles of the genito-urinary tract. Infusions of young shoots are given in dysentery. Fresh root is used as a remedy for jaundice. Milky juice is used as application to offensive sores.

Powered leaves and roots are pulverized and made into poultice with rice water used to lessen oedematous swellings and ulcers.

A decoction of the plant is administered in jaundice or half ounce rubbed up in a cup of milk is given morning and evening, or the root or the dried small bitter leaves in powder, are used in teaspoonful doses.

Young tender shoots are administered in the form of infusion for chronic dysentery. The juice of the stem mixed with oil is used in opthalmia. The whole plant pounded with its root and combined with rice water is used as poultice for ulcers, sores and swellings. A poultice of the leaves mixed with salt cures itch and other skin affections.

In Brazil, a tea made from the whole plant is used as a treatment for painful kidneys. Boiled plant is used to treat poor appetite, constipation, typhoid fever in Bahamas.

6.2.1 Home remedies from *Phyllanthus niruri*

Jaundice : A decoction is prepared using one cup of root with four cups of water boiled till it is reduced to one cup in a covered vessel. Infused for 20 minutes, and filtered and is taken in dosages of one cup per day for a week, on an empty stomach. Alternatively 10 grams of root, grounded in milk is taken twice a day.

Dysentery : An infusion is prepared from dried and cleaned young shoots of the plant by pouring boiling water. It is left for 20 minutes is filtered and drunk.

Stomach upset : An is infusion prepared with dry clean leaves by pouring boiling water, infused and filtered, before drinking.

Constipation or as a diuretic or digestive : A decoction is made of the whole plant, reduced to quarter and taken on an empty stomach daily for a week. Leaves in powdered form can also be taken in teaspoon doses.

Sores : Milky juice of the washed ground plant, is strained through a clean cloth and applied on to the sore.

Malaria : A decoction of the whole plant can be taken.

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