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Phytochemical Screening, Antibacterial Activity And Leaves Extract Of Phyllanthus Niruri

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ABSTRACT :
The present study showed the antioxidant and antimicrobial activity of plant extract of Phyllanthus niruri. The antioxidant and antimicrobial activity of the plant extract may be due to the presence of different phytochemicals such as phenol, flavonoid, terpenoid, and saponin. The study supports the use of P. niruri in Ayurveda and traditional medicine throughout the world. It can be used as a potential source of antioxidant which can be used to cure various ailments and an antibacterial drug that can be used to inhibit the growth of various pathogenic and antibiotic resistant bacterial strains.

KEYWORDS : Antioxidant, Antimicrobial Activity, Phytochemicals

1. INTRODUCTION

Phyllanthus niruri (Linn), member of family Euphorbiaceae is a winter weed occurs across the hotter place in India. The Phyllanthus genus contains over 600 species of shrubs, trees and annual or biennial herbs distributed throughout the tropical and subtropical areas.[1] This plant grows up to 30 to 60 cm in height considered as an herbaceous weed found near to the cultivated lands, waste places and roadsides. The plant is native to the rain forests in the Amazon and tropical areas including India, China, Pakistan and Bahamas,[2] P. niruri has several benefits as a herbal medicine. The plant has been found to have hepatoprotective, antilithic, pain-relieving, antifungal, diuretic, antispasmodic, hypoglycemic, antiviral and anti-bacterial actions[1] The therapeutic action has been investigated with respond to following diseases: diarrhea, dysentery, dropsy, mouth and throat infection, veneral diseases, pimples, eczemas, gangrene, malaria, syphilis, ulcer, urethral secretion, hepatic diseases and gastro-intestinal disorders.[3]

2. BOTANICAL CLASSIFICATION: PHYLLANTHUS NIRURI L.

Kingdom – Plantae

Division – Magnoliophyta

Class-Magnoliopsida

Order-Euphorbiales

Family– Euphorbiaceae

Genus– Phyllanthus

Species – Niruri

Fig-Phyllanthus Niruri Tree

3. PHYTOCHEMISTRY

Phyllanthus niruri plant shows significant activities on various diseases in many ways and it was essentially evaluated and analyzed.

Sr. No.	Class	Compound
1	Alkaloid	4-Methoxy-nor-securinine, nirurin, ent-norsecurin
2	Benzenoid	Gallic acid, Corilagin
3	Coumarin	Ellagic acid, ethyl brevifolin carboxylate
4	Flavonoid	Quercetin, rutin, astragalin, quercitrin, isoquercitrin, kaempferol-4-rhamnopyranoside,eridictyol-- rhamnopyranoside, fisetin-4-O-glucoside, nirurin, isolintetralin Ricinoleic acid
5	Lignin	Phyllanthin, hypophyllanthin, niranthin, nirtetralin, phyltetralin, hinokinin, isolintetralin

6	Lipid	Ricinoleic acid
7	Phytallate	Phyllester
8	Sterol	Estradiol, ß-sitosterol, isopropyl-24-cholesterol
9	Tannin	Geranin
10	Triterpene	Lupeol acetate, lupeol, 3,7,11,15,19,23- hexamethyl-2Z,6Z,10Z,14E,18E, 22Etetracoshenen- 1- ol, phyllanthenol, phyllanthenone, phyllantheol

4. PHARMACOLOGICAL ACTIVITY

a) 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's 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.[4] The CaOx metastable limit was decreased by the treatment of P. niruri [5% [v/v]] extract and it can also deprive the CaOx crystals and formation of nucleation.[5] 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.[6]

b) Liver protective, detoxification & antioxidant activity

The carbon tetrachloride and galactosamine induced cytotoxicity in rat hepatocytes can be decreased by the P. niruri hexane extract. Phyllanthin and hypophyllanthin protects against the CCl4 induced cell lesions and GalN induced Hepato toxicity.[7] Phyllanthus niruri 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 three 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[8] & Oxidative stress. [9]

5. MEDICINAL USES

1.It has antioxidant properties.

2.It has antimicrobial properties.

3.It has anti-inflammatory properties.

4.It may help protect against ulcers.

5. It may help lower blood sugar.

6.It may help prevent kidney stones.

7.It may improve liver healths.

6 . MATERIALS AND METHOD

Aluminum chloride, 1, 1 diphenyl 2-picrylydrazyl, Ferric chloride, Folin- Ciocalteau reagent, Gallic acid, Hydrogen chloride, Methanol, Mercuric iodide, Sodium carbonate, Sulphuric acid, Trichloroacetic acid, Quercetin from Hi- Media.

a) Sample Preparation

Phyllanthus niruri leaves were collected from Bhandara district in Maharashtra in the month of March 2022. The leaves were washed with water to remove dust particles. The washed leaves were dried at room temperature and then powdered mechanically. The powdered leaves were extracted with the help of Soxhlet apparatus with methanol (80%) as a solvent 24 Hrs. and Dried in Desiccators. One the process was finished, the methanol evaporated using a rotary evaporator leaving a small yield of extracted plant material in the glass bottom flask. The methanol extract dark greenish residues. The extract were then kept in sterile bottles and put in refrigerator at 4^{O}c until further use.

b) Phytochemical Screening

The phytochemical screenings were performed by following the standard procedures mentioned in Harbone.[10] Screenings for the presence of saponin, alkaloid, tannin, flavonoid, phenol, terpenoid and carbohydrates were performed.

Table 1: Phytochemical screening of Phyllanthus niruri plant extract

Sr. No	Phytochemicals	Method	Observation	Phyllanthus niruri
1	Saponins	Emulsion formation test	Formation of emulsion	Positive
2	Alkaloids	Mayer's reagent test	No characteristic changes	Positive
3	Phenols	Ferric chloride test	Blue color appeared	Positive
4	Terpenoids	Sulphuric acid test	Reddish brown color	Positive
5	Flavonoids	Ammonia test	Yellow color disappeared on standing	Positive

7. ANTIBACTERIAL ASSAY

The antimicrobial activity of these bacterial strains was assessed by the agar well diffusion assay. Nutrient Agar media was prepared and poured in Petri-dishes. After the solidification of agar media, 0.1 ml of each bacterial strain was spread over the media. Wells (7 mm) were made in the Petri-dishes, and 50µg/ml (100µl) extract of P. niruri in DMSO was deposited into respective wells. The plates were incubated for 24 hours at 37^0C. DMSO and Vancomycin were used as controls. After incubation, the zone of inhibition around the wells was detected, and the diameter of these inhibition zones was measured and recorded.

Table 2: Antibacterial activity of Phyllanthus niruri

Bacterial strain	**Diameter of zone of inhibition formed by Phyllanthus niruri (mm)**	**Diameter of zone of inhibition formed by vancomycin**
Gram-positive		
1. Lactobacillus acidophilus	10	13
2. Staphylococcus aureus	13	20
Gram-negative		
1. Escherichia coli	10	13
2. Pseudomonas aeruginosa	12	19

8. RESULTS

This study aimed at phytochemical screening, determining antioxidant activity and antibacterial activity of Phyllanthus niruri. It showed the presence of phenol, flavonoid, saponin, alkaloid, and terpenoid. These compounds are responsible for the antioxidant activity and antibacterial activity.The presence of phytochemicals in the extract of P. niruri was screened qualitatively. The result showed the presence of phenols, flavonoids, alkaloids, terpenoid and saponins Phenols and flavonoids have significant antioxidant properties. Phenols are also associated with the ability to inhibit the growth of bacteria.[11] Furthermore, these compounds have shown anti-inflammatory, anticancer and antidiabetic activity. The presence of these compounds formed the basis of further evaluation of the antioxidant and antimicrobial properties of the P. niruri extract.

9. CONCLUSION

The present study showed the antioxidant and antimicrobial activity of plant extract of Phyllanthus niruri. The antioxidant and antimicrobial activity of the plant extract may be due to the presence of different phytochemicals such as phenol, flavonoid, terpenoid, and saponin. The study supports the use of P. niruri in Ayurveda and traditional medicine throughout the world. It can be used as a potential source of antioxidant which can be used to cure various ailments and an antibacterial drug that can be used to inhibit the growth of various pathogenic and antibiotic resistant bacterial strains.

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