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A COMPREHENSIVE REVIEW ON BENEFICIAL PROPERTIES OF PHYLLANTHUS NIRURI (Bhue Amla)

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ABSTRACT :

BACKGROUND:- Phyllanthus niruri Linn. (P. niruri) commonly known as Bhue Amla or Bhumi Amla or Bhumyamalaki or Indian Gooseberry is a medicinal plant widely used in Ayurvedic and traditional medicine for treatment on a wide scope of diseases. Native to tropical regions of Asia, Africa, and the Americas, Phyllanthus niruri grows as an annual herb in wetlands, forests, and grasslands.

METHODS AND MATERIALS:- The literature on Phyllanthus niruri has been gathered from Google Scholar, Pubmed, Web of Science and a library. This review showcases an extensive and current information on the distribution, botany, as a health beneficiary, phytochemistry, pharmacokinetics and pharmacodynamics of Phyllanthus niruri.

RESULT:- Phyllanthus niruri's phytochemistry reveals a diverse range of bioactive compounds responsible for its medicinal properties like the alkaloids, flavanoids, glycosides, terpenoids, tannins and phenolic acids. The major useful components are present in the stem and the leaves. Various pharmacological effects of the plant includes hepatoprotective, antiviral, antioxidant, anti-inflammatory and antimicrobial activities were discovered by extraction and use of active ingredients. Widely used in many formulations to treat infectious diseases, liver disorders, digestive issues, cancer, endocrine disorders and many others.

CONCLUSIONS:- This is the effort to collect and record data on many aspects of Phyllanthus niruri and puts more light on the further study and updation. The botanical, pharmacological, biochemical and medicinal aspects of the plant are briefly reviewed in this article. This review article will be an asset in availing information for further research; more researching and clinical trials are necessary to declare the plant as a therapeutic agent.

KEYWORDS:- Phyllanthus niruri, Pharmacology, Alkaloids, Hepatoprotective, Phytochemistry.

1.INTRODUCTION :

The perennial tropical plant Phyllanthus niruri has been used in traditional medicine in South and Southeast Asia to treat a variety of ailments, including but not limited to kidney stones, dyspepsia, jaundice, diarrhoea, and genitourinary infections.[1] Folk medicine has historically employed herbal remedies to treat a wide range of medical conditions, such as inflammatory, malignant, diabetic, hypertensive, and cardiovascular disorders.[2] The herb has been used for thousands of years in Ayurvedic traditional medicine to treat a wide range of ailments.[3] The Malay traditional medicine uses P. niruri, also called "dukong anak," to treat cough and kidney problems. The herb, known as Bhumyamalaki in South India, is thought to cure syphilis, gonorrhoea, and constipation. This plant, referred to as "pitirishi" in the local dialect, is well-known for being a common home cure for TB, bronchitis, and asthma in northern India.[1] Phyllanthus means "leaf and flower" because the fruit and the flower appear to merge into one. A prevalent kharif (rainy season) weed in both wastelands and farmed fields is Phyllanthus nirui. Because of its hepatoprotective qualities, it has drawn the interest of researchers recently.[5] Techniques including microwave-assisted percolation, maceration, decoction, infusion, and Soxhlet extraction supercritical fluid, as well as extraction using enzymes Techniques were applied. In light of a section (leaves, bark, root, or the entire plant, extraction of stem) was extracted. Every component as a potential for medicinal application, such as leaves and stems both as dye and as ink. Complete plant extract is utilised to treat diabetes mellitus, cough, and red eyes. The scalp is treated with root extract. as well as jaundice. It also features cooling laxative and carminative qualities.[26]

2. METHODOLOGY :

A range of databases, including PubMed, Web of Science and Google Scholar, CAB Abstracts, MEDLINE, EMBASE, and INMEDPLAN, as well as websites like www.jstor.org, www.sciencedirect.com, and www.eflora.org, were used to identify the data under the various sections on distribution, traditional and modern uses, phytochemistry, and pharmacological activities of P. niruri species. This was carried out following a careful and meticulous analysis of the body of previous research. Verification has been done on the taxonomy of the species names included in this review. thelistofplants.org, as well. After the bioactive compounds were searched through the ChemSpider and PubChem databases, the chemical structures were redrawn using ChemDraw® software (version 8.0). The reviewed literature consists of several abstracts, full-text articles, books, PhD theses, and blogs. The best available research was taken into account and considered into the review.[7]

MORPHOLOGICAL DESCRIPTION OF PLANT

Description of Botany and Common Names:

Phyllanthus niruri is an annual plant that grows upright to a height of 40 to 70 cm. It has upward herbaceous branching and is glabrous at the base. Because the flower and fruit can be connected to the leaf, the genus Phyllanthus is named after the leaf and flower. It is a plumose leaf that bears fruit and flowers.
Leaves: Many, tiny, green, subsessile, tightly clustered, elliptic, elongated, obtuse, with a short petiole and stipules present; alternately placed on both sides of the stem.
Flowers: The blooms are axillary, tiny, yellowish, and abundant. These flowers are monoecious and unisexual; the male blooms have one to three sessile stamens, while the female flowers are solitary by nature.
Fruits: Fruit is a smooth, little, depressed globe that is shaped like a capsule is smooth, 2- 3mm in diameter.[16]
Microscopic characters - The observations of the studied microscopic characters compiled in a comparative manner with respect to three important parts of the plant viz. root, stem and leaf. a) Root - The TS of root shows epidermis a single layer of thin walled cells. The cortex region with 6-8 layers of parenchymatous cells without intercellular spaces. The inner cortex consists of patches of macrosclereids. The vascular cylinder consisting of 5-8 layers secondary phloem cambium and25- 40 layers of secondary xylem along with fibers (pits rare, bordered; ends tapering; wall tetra-to hexagonal), vessel members (long with tails at both ends, pits circular, bordered; perforation plate simple).[26] The xylem parenchyma is thin walled with uniseriate rays, 3-8 cells high, usually heterogenous type while the pith is parenchymatous. b) Stem - The TS of the stem is circular in outline and shows central pith occupying the major area of the section, encircled by continuous band of xylem and a ring of discontinuous periclyclic fibers, narrow parenchymatous cortex, a layer of epidermis and collenchymatous narrow hypodermis. The detailed TS at 40x shows a layer of epidermis, embedded with stomata, at places bearing papilla and covered with thick cuticle, a narrow band of chlorenchymatous hypodermis lies underneath this followed by 2 to 3 rows of chlorenchymatous cortex, pericycle is characterized by discontinuous ring of groups of thin walled fibers. [27]Phloem is narrow, parenchymatous, cambium is distinct, xylem consists of radial rows of vessels tracheids, thinwalled fibres, parenchyma and uniserate to biseriate medullary rays; pith is wide and parenchymatous; cells getting disintegrated on drying developing cavity in the centre, cluster and rosette crystals of calcium oxalate throughout the parenchymatous cells of the cortex and the pith. c) Leaf- The transverse section of the leaf passing through midrib is slightly elevated on the lower side and flat on the upper side. It shows layer of upper epidermis, its cells being bigger in size than the lower one and cover with thin cuticle. At placesit is papillose and embedded with stomata, underneath the upper epidermis lies a layer of palisade in continuation with the midrib. Meristele of the midrib consists of radiate xylem and an arcof phloem; underneath the palisade layer of lamina lie 2 to 4 rows of spongy parenchyma traversed with obliquely cut vascular bundles and prismatic and rosette crystals of calcium oxalate.[12]
Ethnobotany: Phyllanthus niruri has a lengthy history in tropical countries' healthcare systems and a wide range of therapeutic uses. Traditional health care systems are aware of the plant.The common name for Phyllanthus niruri is "Chanca pedra" or "stone breaker."[25]However, there is a great deal of misunderstanding over the identification of this species. In addition to being used as a diuretic, hypoglycemic, and hypertensive medication, Phyllanthus niruri is also used as a folk remedy for kidney and gallbladder stones, liver-related conditions like liver cancer, and jaundice. It also possesses anti-inflammatory, anti-tumor, anti-nociceptive, and antioxidant qualities..
[6]
Botanical classification: Phyllanthus niruri L. Kingdom – Plantae Division – MagnoliophytaClass – Magnoliopsida Order – Euphorbiales Family – Euphorbiaceae Genus – Phyllanthus Species – Niruri.[24]
Vernacular names: In India Assamese: Holpholi; Hindi: Bhumi amla, Chalmeri, Harfarauri,English : Gale of the wind Telugu: Ratsavusirike, Nela Usiri,Tamil: Arunelli, Keela Nelli, Marathi: Rayavali, Bhuiavli, Sanskrit: Amala, Bhumyamlaki, Sukshmadala, Vitunika, Bhoodatri.[23]
Phytochemical Properties: Phytochemistry is regarded as the heart of herbal therapy and the phytochemical research plays an importantrole in the development of green medicines, which are safer to use. The major class of bioactive compounds like alkaloids.[13]
Stem : It is having horizontal branches and height of 30-60cm, 1-2.5mm width. Root : It is somewhat branched and large. flavonoids, lignans, phenols, tannins, terpenes and volatile oils has been isolated. These bioactive compounds further include their respective phytoconstituents.[14]
Pharmacognostic studies Morphologic study of Phyllanthus species - A morphological research was conducted using the methods described. Sensation organs are used for organoleptic evaluation, which offers the quickest and easiest way to confirm a drug's identification and purity and guarantee its quality. Organoleptic characteristics were assessed, including size, shape, colour, and the margin, apex, base surface, venation, and inflorescence of the leaf.[23]
Microscopic study of Phyllanthus species - The dried plant materials (root and stem) were cooked in distilled water for 10 to 15 minutes to soften them before the transverse section was taken for the microscopic examinations. For two hours, the leaves were submerged in ordinary water.[14] Freehand transverse slices of the root, stem, and leaf were obtained for microscopic examination. The sections were stained and mounted in accordance with

standard plant microtechnique procedures. Phloroglucinol and HCL were the primary staining agents used on the plant material sections, which were then mounted with a few drops of glycerine.[25]

Physico-chemical analysis - The proportion of total ash, acid-insoluble ash, water-soluble ash, and water-soluble and alcohol-soluble extractives were among the physicochemical values that were determined using conventional methods and in compliance with the Indian Pharmacopoeia.[26]

Determination of total ash: A silica crucible that had been previously lit and weighed was filled with five grammes of the pulverised plant material. Next, a thin, equal coating of the ground plant material was applied to the crucible's bottom. After that, it was burned in a muffle furnace until it was carbon-free by progressively raising the temperature without going over dull red heat. It was then cooled and weighed.[15]If this method failed to produce carbon-free ash, hot water was used to exhaust the charred mass. An ashless filter paper was used to collect the residue, which was subsequently burned. The air-dried material was taken into consideration while calculating the ash percentage.[16]

(g) **Determination of Water Soluble Ash**Ten millilitres of distilled water were used to boil 100 milligrammes of ash for five minutes. The insoluble material was gathered either on ash-free filter paper or in a silica crucible. After being cleaned with hot water, it was burnt at low temperatures to maintain its weight. The weight of the ash was deducted from the weight of the insoluble material. The amount of ash sampled was used to compute the proportion of water-soluble ash.[16]

Determination of Acid Insoluble Ash: 25 millilitres of 10% HCl were used to boil the entire amount of ash for five minutes. The insoluble ash was gathered either on ash-less filter paper or in a silica crucible. After being cleaned with hot water, it was lit and weighed. The weight of the ash was deducted from the weight of the insoluble material. The acid-insoluble ash is represented by the weight difference. Using the quantity of ash collected, the percentage of acid-insoluble ash was computed.[16]

Determination of extractive value with different solvents: The total amount of ash was boiled for five minutes in 25 millilitres of 10% HCl. The insoluble ash was collected in a silica crucible or on ash-free filter paper. It was cleansed with hot water, then weighed and ignited. The weight of the insoluble substance was subtracted from the weight of the ash. The weight difference represents the acid-insoluble ash. The proportion of acid-insoluble ash was calculated using the amount of ash that was collected.
[16]

Medicinal uses: 1) Phyllanthus has several ancient uses and has been utilised in Ayurvedic medicine for more than 2,000 years. 2) This includes applying the entire plant topically as a poultice for skin ulcers, sores, swelling, and itching, as well as utilising it for jaundice, gonorrhoea, frequent menstruation, and diabetes.[11]3) The herb has antiseptic, cooling, diuretic, stomachic, astringent, bitter, and febrifuge properties. It helps with urino-genital system disorders, scabies ulcers and sores, intermittent fevers, dropsy, jaundice, diarrhoea, and dysentery.[18] 4) To treat persistent diarrhoea, the plant's young branches are given as an infusion. There is no question about its effectiveness in treating gastrointestinal conditions like dyspepsia, colic, diarrhoea, constipation, and dysentery. 5) It is used to treat mammary abscess, leucorrhea, menorrhagia, and galactogogue in females.[16] 6) It has been used successfully for many years to treat skin disorders, including ringworm, oedematous swellings, scabies, offensive ulcers and sores, bruises, wounds, and tubercular ulcers. It works well for gonorrhoea, intermittent fevers, ocular conditions, and conjunctivitis.[16]

Traditional uses: 1. For jaundice, a dose of 10–20 ml of whole plant juice should be taken three times a day. 2. Fresh milk is combined with 10 grammes of powdered fresh roots. To effectively treat jaundice, this is advised to be taken in the morning.[17] 3. To treat skin conditions, the crushed leaves were mixed with salt. 4. The plant concoction worked wonders for chest pain and diabetes. 5. Leaf or root decoction is used to treat ulcers. 6. The plant's dry powder is applied to wounds and ulcers together with gruel water. 7. For leucorrhea, gonorrhoea, menorrhoea, and other urinary complaints, 45–50 ml of the plant's juice can be taken in the morning.[16]

Hepatoprotective – In India, herbal remedies have long been used to treat liver diseases, and the majority of the medications on the market are derived from Ayurvedic, Siddha, and Unani traditional medical systems. Some Indian medicinal plants (PICRORHIZA KURROA, MORINDA CITRIFOLIA, Andrographis paniculata, Phyllanthus niruri, and ECLIPTA alba) and the polyherbal formulations (Liv 52, Livergen, Octagen, Stimuliv, Tefroliv) made from these plants are effective as hepatoprotective agents, according to preclinical and human studies conducted over the past 20 years. The majority of these substances, meanwhile, are pharmaceuticals and not often found in food. From a human standpoint, it is usually preferable to have hepatoprotective substances that are a regular part of the diet so that the recipient does not have to pay extra attention to following the treatment or prevention plan.[22] Recent research indicates that dietary agents like fennel (Foeniculum vulgare), fenugreek (Trigonella foenum-graecum), turmeric (Curcuma longa), mangosteen (Garcinia mangostana), Indian gooseberry (Phyllanthus emblica), and ginger (Zingiber OFFICINALE) are effective hepatoprotective agents in a variety of study models. Among these, ginger, a typical spice, is perhaps the most widely used and researched herb for its hepatoprotective properties.[16]

Antidiabetic – Hypoglycaemic action: It is generally acknowledged that chronic hyperglycemia causes increased oxidative stress, which contributes to the development of diabetes and its consequences.[21] Inhibition of enzymatic pathways in intestinal carbohydrate digestion and glucose storage may be the cause of dose-dependent improvements in fasting blood sugar, improved glucose tolerance, and restoration of pancreatic tissue architecture observed in animal studies employing Phyllanthus niruri extracts.[20] The extract's bioactive components are believed to have insulin-mimicking activity or maybe to stimulate the synthesis of insulin, as evidenced by their capacity to raise liver hexokinase activity and improve hepatic glycogen content. Notwithstanding these discoveries, the antidiabetic potential of Phyllanthus is yet unknown, as different genus members have produced differing outcomes.[19]

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