IJPHT Journal
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International Journal of Pharmacy and Herbal Technology- ISSN NO: 2583-8962 (Online)

REVIEW: OVERVIEW ON PHARMACOLOGICAL AND PHYTOCHEMICAL PROPERTIES OF PHYLLANTHUS AMARUS SCHUM & THONE

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ABSTRACT:
Schum and Thonn flowers Phyllanthus has been used in traditional medicine for approximately 3000 years. In addition, it goes by additional names like "stone breaker," "gala of wind," "carry me seed," and so on. That is right—it belongs to the Euphorbiaceae family. In tropical and subtropical areas, this annual plant with branches can reach a height of 30 to 60 cm and is frequently encountered as a weed. Because Phyllanthus amarus contains a variety of secondary metabolite combinations, it has, curative, antiseptic, and anti-allergic anti-carcinogenic additionally hepatoprotective attributes. Volatile oils, sterols, alkaloids, flavonoids, lignans, tannins, and triterpenes are among the recognized members of the primary class of bioactive chemicals. Phyllanthin and quercetin, two types of flavonoids, were extracted from P. amarus leaves.

Keywords: *Phyllanthus amarus, pharmacological action, phytochemicals, and traditional applications.*

INTRODUCTION:

Phyllanthus[1] is a highly significant plant genera that are widely available in India as unrefined herbal treatments. Within the family Euphorbiaceace, the genus Phyllanthus comprises about a thousand species that are found in the Caribbean and the lower caribbean regions including the nation, because the United States, Africa, or and Asia[2,3]. In India, A common weed in both cultivated and garbage dumps is The flowering plant amarus[4] .forests, bushes, and flowers is each of the primary morphological collections which feature within the The flowering plant variety. Additionally, Ravikant his company has determined that the genetic hotspot for Phyllanthus species is in southern India[5]. People have long employed Phyllanthus amarus Schum. and Thonn. Because of its long medical history.Often called Bhumi amla, this plant was an element or a large group used plants and flowers that are commonly prostatic as upright[6].

Throughout Unani therapy books, this has been referred to as the "Bhuti " and Bhum Amlak, and Leela on Field[7]. This is essential to advance the development of ecologically sound treatments that are more effective and simpler to apply than expensive, chemically Manufactured which have no negative reactions. P. Amarus is known within Bhoodha shrub, Tamalaki, as Bhoomy-aamlakee of Hindi [8] in Ayurveda. Amarus P. is becoming more widely used due to its distinct antiviral properties against the hepatitis B virus as well as its other biological effects, which include the treatment of kidney and gallbladder stones, the flu, TB, liver diseases, and more[9].

Table no-1 Scientific Classification: -

Kingdom	**Vertebrates**	**Kingdom**	**Vertebrates**
Section	Plant Vascular plants family	Arrangement	Tubiflorae
Category	Dicotyledoneae	siblings	Thea family called Eu
Type	The flowering plant	The variety of plant	Amarus

Vernacular Identify: -

Locals refer to the plant by a variety of colloquial names depending on where they live . It is often referred as carry me a leaf, a flower, a windstorm, a stone, or a seed[10]. Phyllanthus gets its name from the fact that it resembles a combined flower, fruit, and leaf[11].

Table no-2 The Names of Phyllanthus Amarus Used Worldwide They are provided below.

Sr.no	**Language**	**Common Language Name**
1	Hindi	In Hindi, that bhumi the herb amla jangli amli
2	the English language	Dark English Cantina,Take me the first seed,come back, A strong wind, the Gulf wing flower, hurricane weed, stonebreaker.
3	Rajasthani	Gorgario
4	Sanskrit	Tamalakee, Bhoodhatree, or Bhoomyaamlakee
5	Tamil	Keelanelli (Keezhanelli)
6	Bengali	Bhui amla
7	Kannada	Nela- Neli , Kirunelli
8	Oriya	Bhujaola
9	Telugu	Nela urika

10	America	Hurricane weed[10], Chanka piedra [13]
11	Spanish	Yreba magica
12	French	Ivory Coast French poudre de plomb

Botanical Characteristics: -

This plant amarus serves as an every year, hairless shrub which develops an extension of thirty to sixty centimeters without spreading. The leaves that it has were leaflets bearing and thin. Its distinct subsessile petals are distinguished by a narrow, flattened bottom that has an elliptic-oblong overall form. The shade of apical blooms can range from yellow, white, or greenish. Masculine emerges can be discovered in collections ranging from anywhere from one to three, whereas female flowers are single.

Beneath the branches can be smooth capsules that resemble depressed globes, with pale brown, trigonous fruits with 14 equal longitudinal ridges on the back [14]. Six seeds are contained in 1-2 mm long, spherical, smooth capsules that are 2 mm broad on stalks. The seeds are propelled some distance from the plant by the explosive seed capsule found on the plant. The seeds are 1 mm long, triangular, light brown, and have five six back ribs [10,15,16].

Fig 1 :- Phyllanthus Amarus Schum and Thonn

Morphological Location :-

Plant is a prevalent pantropical plant which grows in warm out wet shadowed situations. It is abundantly widespread throughout both the equatorial and tropical regions [11,16]. The plant called category update in the definition of Webster classification included closely related taxa. the plant as an element belonging to the Swartiziani sub-part of the This plant group. A comprehensive examination was carried out on P. amarus's taxonomic distinctiveness, relatedness, or naming in the context of its shape and location in the world [17,19] Since

P. abnormis were prevalent in the southern America's regions with deserts. including Florida and Texas, this appears to be linked to it.Research indicates that This plant amarus across the Caribbean was an end result to P. abnormis, a vicariou plant which has become prevalent throughout the southern United States, where shipping dispersed this species. Throughout the tropics[17] Of the approximately 1000 species in Phytophthora spp. across India. There are fifty-three species of mushrooms, including, and among theseOf them, [23] are endemic. Across the Indian subcontinent, they are distributed, with the highest densities found in the south. Thirteen herb species, thirty-seven shrub species, and three tree species make up the 53 species of Phyllanthus [20].

The researchers Jain e (2003) employed spontaneously expanded recombinant genetic material (RAPD, which) indicators for assessing the genetic variation and P. amarius throughout India were examined. All [33] places that were utilized for determining variation in gene expression comprised the following types of providers: the province of Bengal, Mumbai, Tamil Nadu, Bangalore, India, states such as Uttar Pradesh, Punjab, Haryana, and Goa, Gujarat, Asam, and Haryana. The intrapopulation heterogeneity of accession from southern India was higher than that of accession from other parts of the country. In Rajasthan's dry regions, P. amarus is widely distributed [21].

Material And Method:-

Material:-

1.Plant Collection:-

Phyllanthus amarus fresh aerial pieces were gathered.After washing and chopping, the herbs were allowed to air dry in the shade.

Method

1.Extraction:-

Using a lab milling machine, All dehydrated material has been broken down like an unfinished mixture. The powder was extracted using a Soxlet device and 250 g of 1000 mL methanol. A Rotary Evaporator (CH – 9230 Flawil, Switzerland) was utilized to eliminate surplus solvent, and (Labtech, India) provided a vacuum oven for additional concentration.

Phytochemical Properties:-

The foundation of herbal therapy is thought to be phytochemistry, studies into this field are crucial to the creation of safer green medications (Table 3). Under the most common categories containing naturally occurring compounds include cellulose, flavonoids, alkaline substances, substances amino acids, any of etc volatile oils. chemicals that have been identified. These phytoconstituents are also included in these bioactive substances.

Alkaloids include dihydrosecurinine Quercetin-3-O-glucoside, this compound, astragalin [10,13,2426] and kaempferol are a few of the flavonoids. Likewise,furosin,corilagin,melatonin, amarulone, geraniin, amariin, and phytollanthusin D [22,23] epibubbialine, isobutylene, nor-securinine, and epibubbialine. [13, 24, 26] are examples of tannins. Because lignans contain phyto-constituents such phyllanthin and hypo-phyllanthin, it has significant pharmacological effects.

Hinokinin,5-dimethoxy-niranthin,nirtetralin,phyltetralin,4-(1-(7-methylbenzo[1,3]dioxol-5-yl 1-(3,4-dimethoxy-phenyl))-an-1-ol -2,3-bis methoxymethyl-but [10,23,27,28,29,30,31,32].

Among the sterols are amarosterol A[33]. Triterpenes include phenazine and its derivatives, volatile oils like Phytol [34]and Linalool, and Z, 6Z, 10Z, 14E, 18E, and 22E-fernesesol[24,30] .

Table no-3 Phytochemical Present In Phyllanthus Amarus Schum and thonn

Sr.no	Secondary Metabolites	Definition Structure	Several Significant Phytochemicals	Reference
1.	Alkaloids	A group of nitrogenous materials that are naturally chemical substances derived from plants are called alkaloids.	Dihydrosecurinine, epibubbialine, isobutylene, nor-securinine, and securinine.	22,23
2.	Flavonoids	Flavonoids are water-soluble polyphenolic compounds with fifteen carbon atoms.	Astragalin, quercetin-3-O-glucoside, quercitrin, kaempferol, and quercetin.	24,13, 26,10
3.	The compounds tan	Basic elements, molecules and even peptides have bonds that produce polyphenols, especially bio tannins, to break down compounds with different organic molecules.	Phellodendron D, furosin, corilagin, amarulone, geraniin, and amariin.	13,24, 25
4.	Lignans	A polyphenolic substance called phenylalanine can also be converted into monomers in plant form, and unmodified cinnamon drinks produce cellulose derivatives.	Hinokinin, 5-dimethoxy-niranthine, ib hom hu ua, hypo-philantin, nirtetralin, phyllotetralin, 4-(3,4-diethoxy)-(1) intermediate methylbenzo[1,3]dioxo l-5-ylmethoxymethyl-but-1 -ol-2,3-di	10, 23, 27, 32

5.	Lipid	Then, the CO2 emissions of the triglyceride group and the inability of nutrients to form bonds are the only two differences between the two. The chemicals or steroids found in plants are mostly phytosterols.	a or b are the two forms amarosterol.	33
6.	Triterpens	Chemical molecules known as triterpenes can contain three or six isoprene units. terpene units with the molecular formula C30H48.	Phenazine and its derivatives, farnesyl farnesol, 2Z, 6Z, 10Z, 14E, 18E, and 22E.	30,24
7.	A unpredictable oils	A saturated viscous solvent qualifies as a flammable oil. that contains plant-based volatile aroma ingredients.	Linalool Phytol.	34

Pharmacological Uses:-

Phyllanthus amarus offers an assortment of therapeutic effects and a comprehensive career with the medical sector. It's a well-known traditional treatment for liver-related conditions like jaundice and liver cancer, as well as kidney and gallbladder stones. It furthermore displays anti-inflammatory, anti- cancer, anti-microbial, and anti-nociceptive properties. incredibly employed as well to treat ringworm, scabby and crusty lesions, and skin disorders such as ulcers, sores, swelling, and itching. Additionally, it is used to treat chronic infections, gonorrhea, diarrhea, dropsy, intermittent fevers, wounds, scabies, and tubercular ulcers. Wounds may heal and white patches on the skin can be treated with fresh leaf paste.

The stem juice is also administered as a salve for wounds. Urinary tract issues and liver enlargement are treated with the whole plant extract.The extract from Abdominal symptoms might be addressed by using the rhizome. Snake bites receive treatment superficially using a blossom preparation.

a plant called amarus was previously utilized for alleviating an extensive list of many diseases including the gastrointestinal tract. Choosing plants according to their traditional applications enhances the chances that the study will be successful. Traditional medicine has been using this herb for over three millennia. Whole plant extract is used to treat constipation, diarrhea, dyspepsia, anorexia, liver disease, and urinary tract problem[11] Dr. Several feminine conditions, such as menorrhagia and leucorrhea, are treated with it.

Pharmacological Potential:-

Numerous pharmacological properties, including as diuretic, antiplasmodial, operations which are liver-protective, anti-viral, anti-inflammatory, anti, cancer-fighting, and antibacterial have been identified by studies on P. amurus's pharmacological potential. All plants have the potential to be a source of innovative medications, but only a small percentage of them have had their phytochemical composition and pharmacological properties properly investigated.

Table no-4 Pharmacological Potential Of Major Phytoconstituent Of Phyllanthus .Amarus

Sr no	Class	Phytoconstituent	Pharmacological Effects	Reference
1.	Flavonoids	Rutin	Radioprotective	[63]
			Counter-actant	[64]
		3-O-glucoside quercetin	Counter-actant	[65]
2.	Tannis	Geraniin	Hepatoprotective	[66]
			Antiviral	
			Radioprotective	[67]
		Amarrin	Antioxidant	[64]
			Radioprotective	[64]
			Hepatoprotective	[68]
		Repandusinic acid A	Antioxidant	[65]
			Radiation protection	[63]

		Corilagin	Antioxidant,Radioprotective Antiviral	[63] [68]
3.	Alkaloids	Norsecurinine	Anti-fungal	[69]
4.	Polyphenols		Anti cancer	[71]
5.	Volatile oil	Phytol and linalool	Antimicrobial	[70]
6.	Lignans	Hypophyllanthin	Anti tumor,anti cancer	[72]
		Astaxanthin(phyllanthin)	Hepatoprotective Anti-cancer,anti tumor Antibacterial Anti-aging Antioxidant Anti-inflammatory,inhibiting apoptosis	[73] [72] [63] [64] [74] [66]
		nitratetralin	anti-irritant Antivirals reverse the effects of several drugs	[75] [66] [76]
		Hinokinin	Antiviral	[66]

Pharmacological Activity:-

Out of all the plant species, not enough research has been done on using plants to make new medications. A phytochemical evaluation utilizes just an insignificant measure, along with fewer have had their pharmacological properties properly investigated.[35]

Activity of Antioxidants:-

The ability of P. amarulus methanolic extract Remove superoxide and hydroxyl radicals and block lipids in vitro peroxidation demonstrated its possible antioxidant activity. To suppress lipid peroxide production by 50%, a dose of 104 µg/ml was required, whereas scavenging superoxide and hydroxyl radicals required Nineteen to 117 are milligrams per milliliter, thirty-six respectively[36]. Different types of drying ($P<0.05$) reduced the antioxidant properties of bitter methanol extract; The greatest decrease in TPC and antioxidant activity was observed after microwave drying, as indicated by loss of FRAPand free radical scavenging activity. Even in dry plant materials, boiling water extracts were found to offer higher antioxidant capacity($P<0.05$ increased solubility,compound.Varius2,2-Azobis-3-ethylbenzothiazoline hydroxybiphenyl(DHDP)-glucose, repanthocyanate, geraniol, corilagin, chlorophyll D) Some important products (e.g., lucoside, 1-galloyl-2,3-dehydrohexano) antioxidant activity), routine and quercetin 3-O-glucoside 6-sulfonate (ABTS) / Iron-based myoglobin, It accelerates the radiolysis process and iron-reducing antioxidant capacity (FRAP). Depending on the specific situation, the antioxidant capacity of the drug varies. Flavonoids are acids such as picric acid and crocin. These substances include quercetin 3-O-glucoside 26 and picric acid, safflower acid and oxygen D, as well as herbal antioxidants. Superoxide dismutation enzymes (SOD), catalase (CAT) and glutathione peroxidase (GPx) have antioxidant properties. Plasma LPO levels decreased and GSH, GPx, CAT and SOD activity levels increased in PAAEt administered rats[38]. Bitter almond methanol extract has the highest phenolic concentration and strong antioxidant activity compared to other extracts, especially when compared to in vivo plant extracts54. Free radical scavenging method in callus in vitro using DPPH (1,1-diphenyl-2-dinitrophenylhydrazine).

Antioxidant enzymes including glutathione (GPx), catalase (CAT) and superoxide dismutase (SOD). Plasma LPO levels decreased and GSH, GPx, CAT and SOD activity levels increased in rats administered PAAEt [38]. Compared to other extracts, even in vivo plant extracts, P. bitter almonds have the highest concentration of phenolics and the strongest antioxidant activity [39]. Using Kalli in vitro, free radical scavenging activity was measured using DPPH (1,1-diphenyl-2-dinitrophenylhydrazine) technology.

Anti diabetic Activity:-

It was found that Bitter almond methanol extract could reduce blood sugar by 6% and 18.7% in alloxan diabetic rats at 200 mg/kg body weight. weight treatment[36]. In Togo, P. amarus is used to treat diabetes and many other diseases; Its aqueous and hydroalcoholic extracts have antidiabetic properties. Two oral doses (500 and 1000 mg/kg) of the two drugs were administered to diabetic rats. Thus, aqueous and hydroalcoholic extracts of bitter almond reduce blood sugar by 40% after 15 days of application. Shiti's research shows that oral administration of 400 mg/kg of ethanolic leaf extract to diabetics for 45 days can reduce diabetes and improve liver function (glucokinase)[41].

Antimicrobial Function:-

Antibiotics derived from plants are extraordinarily versatile in their medical uses. They are helpful in treating infectious illnesses [42] and significantly lessen There are There are many side effects often associated with synthetic antibiotics. To determine whether the alkaloid norphylline isolated from Phytophthora nigricans provides protection against fungal spores in the greenhouse. These fungi include Frumentacea Helminthosporium longissima, powdery mildew pea, Alternaria brassicae, Alternaria solani, Curvularia pennisetti and Curvularia sp. is available. Fungi vary in their sensitivity to norphyll.

Norphylline has good protection against most diseases. Pre-grafting application in the greenhouse is better than post-grafting application in preventing powdery mildew on pea plants.

Maximum inhibition was observed at a concentration of 2000 µg/mL[43]. We isolate and develop intestinal bacteria: S and K type bacteria are found in bacteria such as Proteus mirabilis, E. fa and E. coli. Antibiotics were tested using the agar diffusion method and the broth dilution method. Subculture demonstrated the bacteriostatic effect of Phytophthora in concentration and produced growth on all plates except those containing K. pneumoniae. Amygdalol extract showed the widest inhibitory range and lowest inhibitory concentration against all bacteria. Zones of minimal inhibition and relatively large inhibitor concentrations were measured using petroleum ether. The Antibacterial activity of bitter almond aqueous extract was weak in all tests[44] . Bol et al. That disk (15) is shown in Figure 15. A disk partition is used as a precaution. Antimicrobial analysis using the diffusion method. To evaluate the antibacterial and antifungal properties of raw materials and their products, analysis was performed using Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus and Candida albicans. The results showed that the methylene chloride fraction was active against all bacteria tested with a minimum inhibitory concentration (MIC) of 100 µg/ml, while the methanol, hexane and aqueous ethyl acetate fractions were not potent against all diseases. One. No bacterial growth was observed on day 21 or after 45 plates, confirming the results of the antifungal study on the activity of this fraction against C. albicans. This indicates that this drug inhibits Candida albicans from bacterial activity. This is compared to previous research by Wong and Foo (1992)[13].

The ability of ethanol extract to kill the protozoan amygdalin and various E. coli (gram-negative bacteria) has been shown to support their ability to treat prostate cancer. The results of this study led previous researchers to find anti-inflammatory properties of P. amarus [46,47]. In all 5 E. coli samples collected, P. or P. niruri species. According to one theory, using a decoction or infusion of either of these two herbs may be beneficial to treat UTI[48].

Antiviral Activity:-

A study using 25 compounds, including Niranthin, nirtetralin, hynokinin and geranine, were isolated from P. amarus, P. multiflorus, P. tenellus and P. virgatus. were effective in inhibiting HBsAg and hepatitis B among some expressions of positive antibodies (HbeAg). showed that it was. . Non-cytotoxic concentration 50µM. Among them, hinoki parin [49] has the best anti-HBeAg activity and nilansin has Path Toward Liver Antibodies.

The inhibition rate of bitter almond roots caused by Agrobacterium rhizogenes is 85% (control is 15%).) and antibodies (Anti-HBs) bind to[50]. Treat shrimp with P. amarus aqueous extract at a concentration of 150 mg/kg animal body weight for 30 days. had some antiviral effectiveness against the virus [51] that causes white spot syndrome.

. Findings indicated a potential molecular foundation for P. amarus extract's inhibitory effect against HCV, which could aid in the creation of a targeted antiviral drug utilizing P. amarus as a powerful natural source and further optimization[52] .

Anti-cancer Activity:-

P.amarus solution was used intracellularly in MCF-2 roots showed significant antiproliferative activity by inducing Reduce the antioxidant capacity of cell membranes and produce reactive oxygen species (ROS), promoting cell apoptosis 53. MDA-MB-435S human breast tissue cancer cells were employed as in vitro test subjects for Cr (VI)-induced oxidative toxicity when P. amarus was utilized as an aqueous extract. The outcomes

demonstrated that the amount of Cr(VI)-induced cytotoxicity in MDA-MB-435S cells was greatly decreased with an increase in extract dose.

Its phenolic components might also shield MDA-MB-435S cells [54] against oxidative damage brought on by Kr(VI). In addition to its anti-metastatic properties, Phyllostachys sibiricum has also been shown to induce apoptosis. This was demonstrated by more than threefold Number of cells positive for caspase-3 and -7, DNA fragmentation, and terminal deoxynucleotidyl transferase-mediated dUTP nick end labeling assay (TUNEL). This main source of anti-metastatic properties of Phyllostachys sibiricum extract is polyphenolic compounds[55].

Antivenom Activity:-

Botanical extracts of Andrographis paniculata and Phyllostachys paniculata work well in neutralizing snake venom; This means that those poisoned by snake bites will benefit from their treatment. Double herbal extracts effectively prevent death from cobra venom. About 0.24mg of two herbal plant extracts can attenuate two LD50 of cobra venom.[56]

Effects of Fertility:-

Fertility in Men:-

According to traditional healers, a man's fertility can be increased by using the aerial parts of Phyllanthus amarus.Phyllanthus amarus leaf extract raises testosterone levels, but it has little to no effect on Luteinizing hormone (LH) and follicle-stimulating hormone (FSH) levels [57]. This increase may be due to: having more children because adult males need an ideal level of testosterone for good sex drive and an increase in spermatozoa[58].

Infertility in Women:-

Studies have been conducted on female rats receiving 100 mg/kg body weight of oral alcohol for 30 days. It is the extract obtained from the whole bitter almond plant. The results showed no significant change in weight, body weight or general metabolic parameters.Female mice living with male mice always have their own cycles, which inhibits their emotions. On the other hand, it caused miscarriages in some pregnant rats[59] .The purpose of this study is P. fire (AEPA) leaves on implantation and pregnancy. Rats that were pregnant were aborted as a result of AEPA, and the animals who were treated had a shorter implantation period. The traditional notion that Phyllanthus amarus aqueous extract can treat infertility is not substantiated by its abortifacient activity, however it does shorten the time needed for implantation [60].

Reducing Inflammation:-

Flowering plant extracts Bitter almond extracts in the following solvents: water, ethanol and acetone reduce the NO and PGE2 production of LPS. Additionally, tumor necrosis factor (TNF) secretion by LPS decreased due to the effect of the extract.

Both examples limit the transcription level of NF, but not AP-1, and also inhibit the formation of the transcription factor NF. Cytokines and nitric oxide. Amarus antibiotics may reduce cytokines such as Generation Live61 or block the production of immunoglobulin (IL)-1β or IL-10 (such as interferons) in human blood.

They learned how to make methanol extract from the affected plant. different stages of inflammation. The studies included rats with cotton pellet granuloma, air-pouch inflammation from carrageenan, and paw edema from several phlogistic medications. The Phyllanthus amarus methanol extract significantly reduced the paw edema brought on by bradykinin, serotonin, carrageenan, and prostaglandin E1, whereas histamine had no inhibitory effect. The granuloma tissue formation in the chronic inflammation model [62] was significantly decreased by the extract.

CONCLUSION:

Over the years, P. amarus has attracted researchers for its many medicinal uses (discussed below).

Examples include gonorrhea, diabetes, syphilis, jaundice, fever, and dysentery. Although almost all countries are medical, each country has its own regulations regarding the use of medical drugs. This herb has many properties and has anti-diabetic, anti-hepatotoxic, sedative, antiseptic and anti-viral properties. It is very important to find new treatments for many diseases. This species is being researched more because it grows well in warm and temperate regions. It was later seen in Malaysia, Nigeria, India and other countries. The purpose of this review is to describe the research conducted to date in order to provide a suitable basis for future research..

Acknowledgement:

Sincere thanks are extended by the writers to Dr. R. A. Sharma for his guidance. The University Grant Commission in New Delhi has awarded the first author a Junior Research Fellowship.

REFERENCE:

1.Ved DK and Goraya GS: A Textbook of demand and supply of medicinal plants in India. NMPB, New Delhi and FRLHT, Bangalore, India, 2008.

2. Unander DW, Webster GL and Blumberg BS: Usage and bioassays in Phyllanthus(Euphorbiaceae)-IV: clustering of antiviral uses and other effects. Journal of Ethno-pharmacology 1995; 45: 1-18

3.Webster GL: Classification of the Euphorbiaceae. Annals the Missouri Botanical Garden 1994; 81: 3-3

4.Joseph B and Raj SJ: An Overview: Pharmacognostic Property of Phyllanthus amarus Linn. International Journal of Pharmacology 2011; 7: 40-45.

5.Ravikant G, Srirama R, Senthilkumar U, Ganeshaiah KN and Uma Shaanker R: Genetic resources of Phyllanthus in Southern India: identification of geographic and genetic hot spots and its implication for conservation. PhyllanthusSpecies: Scientific Evaluation and Medicinal Applications 2011; 97-118.

6.Lewis W H and Elvin-Lewis P F: A TextBook of Medicinal Botany: Plants ecting Men's Health. A Wiley-InterScience Publication, John Wiley and Sons, Second Edition 1977.

7.Husain S, Alam MA, Ahmed S, Quamri A and Khan MA: Hepatoprotective, anticancer and antiviral effects of Bhui Amla in unani medicine: an overview. Journal of Medicinal Plant studies 2014; 2: 50-52.

8.Patel JR, Tripathi P, Sharma V, Chauhan NS and Dixit VK: Phyllanthus amarus: Ethnomedicinal uses, phyto-chemistry and pharmacology: A review. Journal of Ethnopharmacology 2011; 138: 286-313.

9.Unander DW, Herbert HB, Connete JL and Robert TM: Cultivation of and evaluation of variables potentially affecting yield and the inhibition of viral DNA polymerase. Economic Botany 1993; 47: 79-88.

10.Morton J F: Atlas of Medicinal Plants of Middle America. Library of Congress cataloging in Publication Data, Thomas books, 1981:1420.

11.Cabieses F: Apuntes de medicina tradicional. La racionalización de lo irracional. Notes of traditional medicine. Consejo Nacional de Ciencia y Tecnología CONCYTEC Lima-Perú 1993; 414.

12.Council of Scientific and Industrial Research (India): A textbook of medicinal plants of India. New Delhi: Publications and Information Directorate, Council of Scientific and Industrial Research, 1988.

13.Foo LY and Wong H: Phyllanthus In D, Unusual hydrolysable tannin from Phyllanthus amarus. Phytochemistry 1992; 31: 711-713.

14.Itoro E, Ukana D and Ekaete D: Phytochemical screening and nutrient analysis of Phyllanthus amarus. Asian Journal of Plant Science and Research 2013; 3: 116-122.

15.Wessels Boer JG, Hekking WHA and Schulz JP: Fa joe kan tak'mi no moi: Inleiding in de lora en vegetatie van Suriname; Deel I en II. Why do say that I am not beautiful: Introduction to the Flora and Vegetation of Suriname; Part I and II. Natuurgids serie B No. 4, Stinasu, Para maribo1976.

16.Nanden-Amattaram T: Medicinale Planten: Tips en simpele recepten voor een goede gezondheid. Medicinal plants and simple recipes for good health.Paramaribo-Suriname 1998; 18.

17.Webster G L: A monographic study of the west Indian species of Phyllanthus. J. Arnold Arboric. Harv. Univ. 1957; 39: 49-100.

18.Mitra RL and Jain SK: Concept of Phyllanthus niruri(Euphorbiaceae) in Indian Floras. Bull. Bot. Surv. India 1987; 27: 161-176

19.Chowdhury LB and Rao RR: Taxonomic study of herbaceous species of Phyllanthus L. (Euphorbiaceae) in India. Phytotaxonomy 2002; 2: 143-162.

20.Balakrishnan N P and Chakrabarty T: A Text Book of The family Euphorbiaceae in India - a synopsis of its profile, taxonomy and bibliography New Delhi: Eastern Book 2007.

21.Jain N, Shasany AK, Sundaresan V, Rajkumar S, Darokar M P, Bagchi GD, Gupta AK, Kumar S and Khanuja SPS: Molecular diversity in Phyllanthus amarus assessed through RAPD analysis. Current Science 2003; 85: 1454-1458.

22.Houghton PJ, Woldemariam TZ, Siobhan OS and Thyagarajan SP: Two securinega type alkaloids from Phyllanthus amarus. Phytochemistry 1996; 43: 715-717.

23.Kassuya CA, Silvestre A, Menezes-de-Lima Jr O, Marotta DM, Rehder VL and Calixto JB: Anti-inflammatory and antiallodynic actions of the lignin niranthin isolated from Phyllanthus amarus: Evidence for interaction with platelet activating factor receptor. European Journal of Pharmacology 2006; 546: 182-188.

24.Foo LY: Amarulone, a novel cyclic hydrolyzable tannin from Phyllanthus amarus. Natural Product Letters 1993a; 3: 45-52.

25.Foo LY: Amarinic acid and related ellagitannins from Phyllanthus amarus. Phytochemistry 1995; 39: 217-224.

26.Londhe JS, Devasagayam TP, Foo LY and Ghaskadbi SS: Antioxidant activity of some polyphenol constituents of the medicinal plant Phyllanthus amarus Linn. Redox Report 2008; 13: 199-207.

27.Sharma A, Singh RT and Anand S: Estimation of phyllanthin and hypophyllanthin by high performance liquid chromatography in Phyllanthus amarus. Photochemical Analysis 1993; 4: 226-229.

28.Chevallier A: Encyclopedia of Herbal Medicine: Natural Health. Dorling Kindersley Book, USA, Edition 2, 2000: 336.

29.Srivastava V, Singh M, Malasoni R, Shanker K, Verma R K, Gupta MM, Gupta AK, Khanuja SPS: Separation and quantification of lignans in Phyllanthus species by a simple chiral densitometric method. Journal of Separation Science 2008; 31: 47-55.

30.Maciel MAM, Cunha A, Dantas FTNC and Kaiser CR: NMR characterization of bioactive lignans from Phyllanthus amarus Schum and Thonn. Journal of Magnetic Resonance Imaging 2007; 6: 76-82

31.Huang RL, Huang YL, Ou JC, Chen CC, Hsu FL and Chang C: Screening of 25 compounds isolated from Phyllanthus Species for anti-human hepatitis B virus in-vitro. Phytotherapy Research 2003; 17: 449-453.

32.Singh M, Tiwari N, Shanker K, Verma RK, Gupta AK and Gupta MM: Two new lignans from Phyllanthus amarus. Journal of Asian Natural Products Research 2009; 11: 562-568.

33.Ahmad B and Alam T: Components from the whole plant of Phyllanthus amarus Linn. Indian Journal of Chemistry, Section B: Organic Chemistry including Medicinal Chemistry 2003; 42: 1786-1790.

34.Moronkola DO, Ogunwande IA, Oyewole IO, Baser KH C, Ozek T and Ozek G: Studies on the volatile oils of Momordica charantia L. (Cucurbitaceae) and Phyllanthus amarus Schum and Thonn (Euphorbiaceae). Journal of Essential Oil Research 2009; 21: 393-399.

35.Mabberley DJ: A Text book of the Plant-Book: A Portable Dictionary of the Vascular Plants. Cambridge University Press, Edition 2, 1997

36.Raphael KR, Sabu MC and Kuttan R: Hypoglycemic effect of methanol extract of Phyllanthus amarus Schum and Thonn. on alloxan induced diabetes mellitus in rats and its relation with antioxidant potential. Indian Journal of Experimental Biology 2002; 40: 905-909.

37.Shokunbi OS and Odetola AA: Gastroprotective and antioxidant activities of Phyllanthus amarus extracts on absolute ethanol-induced ulcer in albino rats. Journal of Medicinal Plants Research 2008; 2: 261-267.

38.Karuna R, Reddy SS, Baskar R and Sarala Kumari D: Antioxidant potential of aqueous extract of Phyllanthus amarus in rats. Indian Journal of Pharmacology 2009; 41: 64-67.

39.Sen A and Batra A: The study of in-vitro and in-vivo antioxidant activity and total phenolic content of Phyllanthus amarus Schum Thonn: A medicinally important plant. International Journal of Pharmacy and Pharmaceutical Sciences 2013; 5: 942-947.

40.Evi PL and Degbeku K: Antidiabetic Activity of Phyllanthus amarus Schum and Thonn on alloxan induced diabetes in male wistar rats. Journal of Applied Sciences 2011; 11: 2968-2973.

41. Shetti AA, Sanakal RD and Kaliwal BB: Antidiabetic effect of ethanolic leaf extract of Phyllanthus amarus in alloxan induced diabetic mice. Asian Journal of Plant Science and Research 2012; 2: 11-15.

42. Iwu MM, Duncan AR and Okunji CO: New antimicrobial of plant origin. Alexandra: ASHS Press; 1999.

43.Sahni S, Maurya S, Singh UP, Singh AK, Singh VP and Pandey VB: Antifungal activity of nor-securinine against some phytopathogenic fungi. Mycobiology 2005; 33: 97-103.

44.Sen A and Batra A: Determination of antimicrobial potentialities of different solvent extracts of the medicinal plant: Phyllanthus amarus Schum. and Thonn. International Journal of Green Pharmacy 2012; 6: 50-56.

45.Okwute Simon KI, Okolo Simon C, Okoh-Esene R and Olajide Olutayo O: Biological and chemical evaluation of the extracts of the leaf of Phyllanthus amarus Schum. International Journal of ChemTech Research 2015; 7:2347-2354.

46.Alli AI, Ehinmidu JO and Ibrahim YKE: Preliminary phytochemical screening and antimicrobial activities of some medicinal plants used in Ebiraland. Bayero Journal of Pure and Applied Sciences 2011; 4: 10-16.

47.Njoroge AD, Anyango B and Dossaji SF: Screening of Phyllanthus species for antimicrobial properties. Chemical Science Journal 2012; 56: 1-11.

48.Gbadamosi IT: Antibacterial attributes of extracts of Phyllanthus amarus and Phyllanthus niruri on Escherichia coli the causal organism of urinary tract infection. Journal of Pharmacognosy and Phytotherapy 2015; 7: 80-86.

49.Huang RL, Huang YL, Ou JC, Chen CC, Hsu FL and Chang C: Screening of 25 compounds isolated from Phyllanthus Species for anti-human hepatitis B virus in-vitro. Phytotherapy Research 2003; 17: 449-453.

50. Bhattacharyya R and Bhattacharya S: Development of a potent in-vitro source of Phyllanthus amarus roots with pronounced activity against surface antigen of the hepatitis B virus. In-vitro Cellular and Development Biology-Plant 2004; 40: 504-508.

51.Balasubramanian G, Sarathi M, Rajeshkumar S and Sahul Hameed AS: Screening the antiviral activity of Indian medicinal plants against white spot syndrome virus in shrimp. Aquaculture 2007; 263: 15-19.

52. Ravikumar YS, Ray U, Nanditha M, Perween A, Naika H R, Khanna N and Das S: Inhibition of Hepatitis C virus replication by herbal extract: Phyllanthus amarus as potent natural source. Virus Research 2011; 158: 89-97.53.Abhyankar G, Suprasanna P, Pandey BN, Mishra KP, Rao KV and Reddy VD: Hairy root extract of Phyllanthus amarus induces apoptotic cell death in human breast cancer cells. Innovative Food Science and Emerging Technologies 2010; 11: 526-532.

54.Guha G, Rajkumar V, Ashok KR and Mathew L: Aqueous extract of Phyllanthus amarus inhibits chromium (VI)-induced toxicity in MDA-MB-435S cells. Food and Chemical Toxicology 2010; 48: 396-401.

55.Lee SH, Jaganath IB, Wang SM and Sekaran SD: Antimetastatic effects of phyllanthus on human lung (A549) and breast (MCF-7) cancer cell lines. PLoS One 2011; 6.

56.Sornakumar RSA, Kunthavai PC and Gnaniah S: Isolation, purification and characterization of active compound from Andrographis paniculata L. and Phyllanthus amarus Linn. and testingthe antivenom activity of the di-herbal extract by in-vitro and in-vivo studies. International Research journal of Pharmacy 2014; 5: 207-211.

57.Obianime AW and Uche FI: The Phytochemical constituents and the effects of methanol extracts of Phyllanthus amarus leaves (kidney stone plant) on the hormonal parameters of male guinea pigs. Journal of Applied Sciences and Environmental Management 2009;13: 5-9.

58.Vander A, Sherman J and Luciano D: Human Physiology: The mechanism of body function: McGraw- Hill higher Education. New York USA, Edition 8, 2001: 641-647.

59.Rao MV and Alice KM: Contraceptive effects of Phyllanthus amarus in female mice. Phytotherapy Research 2001; 15: 265-267.

60.Iranloye B, Oyenusi K and Alada A: Effect of aqueous extract of Phyllanthus amarus leaves on implantation and pregnancy in rats. Physiological Society of Nigeria 2010; 25: 63-66.

61.Kiemer AK, Hartung T, Huber C and Vollmar AM: Phyllanthus amarus has anti-inflammatory potential by inhibition of iNOS, COX-2, and cytokines via the NF-κB pathway. Journal of Hepatology 2003; 38: 289-297.

62.Mahat MA and Patil BM: Evaluation of anti-inflammatory activity of methanol extract of Phyllanthus amarus in experimental animal models 2007; 69: 33-36.

63.Londhe JS, Devasagayam TPA, Foo LY, Ghaskadbi SS. “Radio protective properties of polyphenols from Phyllanthus amarus Linn,” Journal of Radiation Research,2009:50(4):303-309.

64.Londhe JS, Devasagayam TPA, Foo LY, Ghaskadbi SS. “Antioxidant activity of some polyphenol constituents of the medicinal plant Phyllanthus amarus Linn,” Redox Report,2008:13(5):199-207.

65.Foo LY. Amarinic acid and related ellagitannins from Phyllanthus amarus. Phytochemistry,1995:39:217-224.

66.Kandhare AD, Ghosh P, Ghule AE. “Protective effect of Phyllanthus amarus by modulation of endogenous biomarkers and DNA damage in acetic acid induced ulcerative colitis: role of phyllanthin and hypophyllanthin,” Apollo Medicine,2013:10(1):87-97.

67. Londhe JS, Devasagayam TPA, Foo LY. “Geraniin and amariin, ellagitannins from Phyllanthus amarus, protect liver cells against ethanol induced cytotoxicity,”Fitoterapia,2012:83(8):1562-1568

68.Notka F, Meier G and Wagner R. “Concerted inhibitory activities of Phyllanthus amarus on HIV replication in vitro and ex vivo,” Antiviral Research,2004:64(2):93-102.

69.Sahni S, Maurya S, Singh UP, Singh AK, Singh VP,Pandey VB. Antifungal activity of nor-securinine against some phytopathogenic fungi. Mycobiology,2005:33:97-103.

70.Moronkola DO, Ogunwande IA, Oyewole IO, Husnu Can Bas K ¸ Ozek T, Ozek G. “Studies on the volatile oils of momordica charantia L. (Cucurbitaceae) and Phyllanthus amarus Seh. et Thonn (Euphorbiaceae),” Journal of Essential Oil Research,2009:21(5):393-399.

71. Lee SH, Jaganath IB, Wang SM and Sekaran SD. “Antimetastatic effects of Phyllanthus on human lung (A549) and breast (MCF-7) cancer cell lines,” PLoS ONE,2011:6(6). Article e20994.

72.Islam A, Selvan T, Mazumder UK, Gupta M, Ghosal S. “Antitumor effect of Phyllanthin and Hypophyllanthin from Phyllanthus amarus against Ehrlich Ascites Carcinoma in mice,” Pharmacologyonline,2008:2(2):796-807.

73.Chirdchupunseree H, Pramyothin P. “Protective activity of phyllanthin in ethanol-treated primary culture of rat hepatocytes,” Journal of Ethnopharmacology,2010:128(1):172-176.

74.Krithika R, Mohankumar R, Verma RJ. Isolation, characterization and antioxidative effect of phyllanthin against CCl4-induced toxicity in HepG2 cell line,” Chemico-BiologicalInteractions,2009:181(3):351-358.2009.

75.Kazuya CAL, Leite DFP, Melo LV De, Rehder VLC, JB, Calixto JB. “Anti-inflammatory properties of extracts, fractions and lignans isolated from Phyllanthus amarus,” Planta Medica,2005:71(8):721-726.

76.Dhir H, Kumar Roy A, Sharma A, Talukder G. “Protection afforded by aqueous extracts of Phyllanthus species against cytotoxicity induced by lead and aluminum salts,” Phytotherapy Research,1990:4(5):172-176.