To Comparatively Study of *Amla* Drug Used as Various Pharmacological Properties

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Abstract: The study investigates the preventive efficacies and safety of Emblica Officinalis Gatertn (Amla) in healthy adults (n = 15) over 18 weeks. Participants were randomized to receive either amla or a placebo (500 mg daily). Key findings revealed significant improvements in blood fluidity, along with reductions in von Willebrand factor (vWF), 8-hydroxy-2′-deoxyguanosine (8-OHdG), and thrombin (TM) biomarkers of oxidative stress. Additionally, there were notable enhancements in HDL-cholesterol and decreases in LDL-cholesterol levels. No substantial changes in liver hepatotoxicity, urinalysis, or hematology were observed after amla consumption compared to baseline or placebo. There were also no adverse events or tolerance issues noted. Amla supplementation exhibited acceptable palatability, improved endothelial functions, and reduced oxidative stress.

Keywords: Diabetes, liver tonic, antioxidant, amalaki, and anti-cancer.

I. INTRODUCTION

Plants have been used as medicines for centuries, and the abundance of traditional knowledge that has been gathered throughout the years has resulted in the development of many new medications made from physiologically active substances found in plants. A sizable section of the world's population still regularly turns to locally grown medicinal plants and products made from plants for their everyday medical requirements. The high expense of Western medications and healthcare, along with the cultural and spiritual acceptance of traditional medicines, are some of the reasons for this reliance on traditional remedies. Between 70% and 95% of people in many developing nations view traditional medicine as their main source of treatment, according to World Health Organization (WHO) reports. In addition to traditional medical systems, the nutraceuticals and cosmetics sectors also heavily rely on herbal medications. Formulations based on compounds derived from plants or their synthetic counterparts make up around 25% of medical prescriptions worldwide. The perceived benefits of medications made from medicinal plants include their ease of use, efficacy, and wide range of actions, with a focus on prevention. Natural remedies are becoming more and more popular in today's global setting because of their low cost, ease of use, and comparatively low frequency of adverse effects. Traditional medical practices are regarded as an essential component of healthcare and are firmly embedded in the cultures of many developing nations. Due to the growing global population, many people are forced to use traditional medications, which are mostly made from plants, because they cannot afford the contemporary synthetic treatments. In general, medicinal plants and herbal medicines are still used to treat medical needs around the world, and their potential advantages and significance in international healthcare systems are becoming increasingly acknowledged. In addition to being vital resources in many domains, such as herbalism and medication research, medicinal plants have been crucial in forming human culture. They are significant for both conventional and modern medicine because they contain active chemicals with therapeutic qualities. Furthermore, certain therapeutic plants are also high in nutrients, which increases their worth even more. Given the large number of plant species found globally and the fact that many of their therapeutic uses are yet unknown, the future of medicinal plants seems bright. Further study and investigation are necessary since these plants may be used to cure present and future illnesses.

Taxonomical Classification:
Kingdom - Plantae
Division - Magnoliophyta

Class - Magnoliopsida
Subclass - Rosidae
Order - Euphorbiales
Family - Euphorbiaceae
Genus - Phyllanthus L.
Species- Phyllanthus Linn. Emblica

Synonyms:

1. Cicca emblica (L.)
2. Kurz Diasperus emblica (L.)
3. Kuntze Dichelactina nodicaulis Hance
4. Emblica arborea Raf.
5. Emblica officinalis Gaertn.
6. Phyllanthus glomeratus Roxb. ex Wall. nom. inval.
7. Phyllanthus mairei H. Lév.
8. Phyllanthus mimosifolius Salisb.
9. Phyllanthus taxifolius D. Don[1]

II. DISTRIBUTION AND HABITAT:

Amla is found in Kashmir, the Deccan, coastal districts, and on 200-meter-high hill slopes. It is widespread throughout tropical and subtropical India, and it is also seen in Burma. In Madhya Pradesh's deciduous forests, it is widely distributed. It also grows in China, Malaysia, South East Asia, Bangladesh, Uzbekistan, Pakistan, and Sri Lanka[2].

Figure:1 Amla(fruit)

Chemical Constituents:
One of the most researched plants is amla. According to reports, it contains phenols, alkaloids, and tannins. 3 Of the tannins found throughout the plant, 28% are found in the fruits. Emblicanin A and B, two hydrolyzable tannins with antioxidant qualities found in the fruit, produce gallic acid, ellagic acid, and glucose upon hydrolysis, while the other produces ellagic acid and glucose. Phyllemblin is also present in the fruit. [4] Gallic acid, corilagin, furosin, and geraniin were among the phytochemicals found via activity-directed fractionation[5]. There are alkaloids like phyllantine and phyllantidine and flavonoids like quercetin. In addition to these, it mostly consists of the amino acids, carbohydrates, and other substances listed in Table 1. The maximum quantity of vitamin C is found in its fruit juice (478.56 mg/100 mL). Vitamin C content is higher than that of lemons, oranges, and tangerines. [6,7].

Plant Morphological Description:
Amla is a small to medium-sized tree that can reach a height of 8 to 18 meters and has red or greenish-grey bark [8]. March through May is flowering season, while September through November is fruiting season.
Bark: Tiny, uneven flakes of thin, light grey bark exfoliate.
Flowers: The axils of the lower leaves bear dense clusters of tiny, inconspicuous, greenish-yellow flowers. Female flowers are small, subsessile, and have three cells in the ovary; male flowers are unisexual and numerous on short, slender pedicels.
Leaves: The leaves are 1.25-2 cm long, 3 mm wide, bifurcated, pinnate, with several alternating, linearobtuse, whole leaflets and spherical, striated petioles.
Seed: Three-celled, oblong-triangular seeds with two seeds in each cell.
Fruit: The fruit is pale yellow, depressed, fleshy, globose, and about 2 cm in diameter. It has three crustaceous cocci with two seeds and six trigonous seeds enclosed in six inconspicuous vertical furrows [9].

Microscopic Analysis:
Fresh fruit is made up of both macroscopic and microscopic fresh fruit pulp (amla).
Macroscopic: The fruit has a globose shape, is 2.5 to 3.5 cm in diameter, is smooth, has six distinct lines, is greenish when it is tender, turns pale yellow or pink when it is old, has a few dark spots, and is sour and astringent[10].
Microscopic: A mature fruit's transverse section reveals an epicarp made up of one layer of epidermis and two to four layers of hypodermis; the epidermal cells are tabular in shape, have thick cuticles covering them externally, and appear polygonal from the surface; the hypodermal cells are tangentially

elongated, have thick walls, and are smaller than the epidermal cells. Several collateral fibrovascular bundles made up of xylem and phloem are dispersed throughout the mesocarp, which forms the bulk of fruit. The mesocarp is composed of thin-walled parenchymatous cells with intercellular spaces; the peripheral 6–9 layers are smaller, ovoid, or tangentially elongated, while the remaining cells are larger, isodiametric, and radially elongated; The mesocarp has enormous aggregates of many irregular silica crystals. The xylem is made up of tracheal elements, fiber tracheids, and xylem fibers. The tracheal elements exhibit reticulate scalariform and spiral thickenings. The xylem fibers are elongated with a small lumen and a pointed end.[11].

Pharmacologacal Activities:

1) Antioxidant:

Along with certain dietary components, nature has bestowed upon us protective antioxidant mechanisms such as catalase, glutathione (GSH), superoxide dismutase, reductase, GSH peroxidases, vitamin C, vitamin E (tocopherols and tocotrienols), etc. Antioxidant activity is known to exist in Indian spices and medicinal plants that are made from natural food ingredients. According to a research by [12], the chemistry and antioxidant qualities of fruit extracts from Emlica officinalis were examined, and the total phenol, total flavonoid, and total tannin assays showed positive results. E. officinalis phenolic compounds' antioxidant effect was mostly ascribed to Gallic acid and tannic acid, two of the fruit's most significant antioxidant components, were found to be present in its phenolic content [13].

2) Antidiabetic:

Numerous studies and trials have demonstrated that amla is a viable and promising substance for reducing blood glucose levels in both healthy individuals and diabetic patients. An ancient herb called amla has been utilized in traditional medicine to treat a number of illnesses, including diabetes. By preventing gluconeogenesis and glycogenolysis, common foods like garlic, onions, turmeric, and amla, among others, have a beneficial impact on regulating blood sugar levels. Consuming roughly 2 to 3 grams of amla powder per day can effectively contribute to lowering LDL cholesterol and raising HDL cholesterol. Similarly, amla fruit has also been used to treat diabetic patients' developing neuropathy. The high vitamin C content of amla has been shown in numerous studies to be crucial in regulating blood glucose levels and, therefore, diabetes in patients [14].

3) Anticancer:

Many of the phytochemicals that have been found and extracted from amla have been shown to have anticancer effects. The polyphenols in amla have been shown to be effective against human cervical cancer cells and Dalton's lymphoma ascites (DLA) by inducing apoptosis through a number of mechanisms, including membrane cracking, internucleosomal breaking, and chromatin condensation. Amla's antiproliferative properties have been attributed to its phenolic content and pyrogallol, whereas polyphenols and chemicals produced from hydrolyzable tannins have been shown to inhibit mutagenesis and lipid peroxidation brought on by carcinogens [15].

4) Cardio-protective:

Due to its potent antioxidant properties and ability to scavenge free radicals, amla has been shown in numerous studies to provide a significant protective effect against changes in the heart system. By raising cholesterol and lowering triglycerides, it enhances cardiovascular health [16]. By lowering over 90% of LDL cholesterol and raising HDL cholesterol, a four-week oral amla supplement helps to alter lipid levels. Additionally, lowering total cholesterol and total triglyceride levels helps prevent cardiovascular illnesses. The polyphenol found in amla fruit juice is thought to be a useful treatment for heart disease and can help repair myocardial damage linked to type 1 diabetes mellitus. Similarly, through the combined action and activity of histamines and cholinergic receptors, water extract lowers blood pressure and maintains heart rate and respiration [17].

5) Antimicrobial:

Many new antibiotics used in clinical settings were developed using traditional plants enhanced with bioactive ingredients. Amla's active ingredients, such as alkaloids, have demonstrated strong antibacterial and antioxidant properties, which could be a key factor in the creation of a safe, effective medication that is reasonably priced. The methanol extract of Emlica officinalis, or alkaloids, and a number of volatile components, including beta-caryophyllene, beta-

bourbonene, 1-octen-3-ol, thymol, and methyl eugenol, found in amla, demonstrated antimicrobial activity against a variety of gram-positive and gram-negative bacteria, according to an in vitro study. Amla fruit water extract also exhibited antifungal activity, demonstrating an impact on harmful microorganisms.

6) Hepatoprotective:

According to reports, Emblica officinalis fruits are utilized in Ayurveda for hepatoprotection. A 50% hydroalcoholic extract of the fruit of the Emblica officinalis plant reduces the severity of hepatic fibrosis brought on by thioacetamide and carbon tetrachloride (Emblica officinalis-50). Emblica officinalis-50 successfully reversed the fibrogenic processes because of its ant oxidative action. Ascorbic acid, tannins, and flavanols are among the phenols found in amla that provide protection against hepatic cell disruption and toxic moieties. In addition to reducing lipid oxidation and elevating blood levels of glutamic oxaloacetic transaminase and pyruvic transaminase, amla water extract has beneficial hepato and nephron effects in ochratoxin A (OTA)-induced oxidative stress in all essential organs. Chronic CCl4 and thioacetamide therapy results in abnormal histopathology that suggests pre-fibrogenic events. Amla's ability to adapt to such changes with notable regenerative advancements demonstrates its protective function in liver pre-fibrogenesis. Hepatotoxic substances include ethanol, paracetamol, carbon tetrachloride, heavy metals, ochratoxins, hexachlorocyclohexane, and anti-tubercular medications, among many others [18].

7) Eye Disorders:

By reducing the likelihood of oxidative pressure due to a reversal of modifications with respect to protein carbonyl content, lipid peroxidation, and the functions of antioxidant enzymes, E. officinalis and its tannoids are used to treat eye problems. Additionally, amla inhibits the buildup and solubilization of lens proteins brought on by hyperglycemia. In addition to reducing intraocular tension significantly, the juice of Indian gooseberries and triphal powder (produced by combining hirda, behde, and amla powder) with honey helps maintain vision and treat glaucoma and conjunctivitis. Amla is used in traditional treatments to treat a variety of eye conditions, including burning, lacrimation, redness, and irritation. Because they inhibit aldose reductase, tannoid-rich fractions of E. officinalis have been proven to have protective effects against diabetic cataract. Another treatment involves applying an infusion of the seeds and exudate gathered from fruit incisions as a collyrium to conjunctival inflammations and other eye conditions.

8) Anti-inflammatory, Analgesic And Anti-pyretic:

Extracts from the leaves and fruits of Embola officinalis have anti-inflammatory, analgesic, and anti-pyretic properties. Amla's aqueous and ethanolic extracts have been used traditionally to treat fever, pain, and inflammatory diseases and have been suggested to have analgesic effects due to a peripheral mechanism. Alkaloids, phenolic compounds, tannins, amino acids, and carbohydrates, on the other hand, have been shown to have antipyretic properties. Amla fruit extracts decrease the synthesis of certain chemokines, limiting the influx of immune cells into the afflicted area and promoting the generation of immune-protective cytokines to hasten the healing process and control inflammatory responses. Among the phytoconstituents of amla that had free radical scavenging activity were emblicanin, ellagic acids, and gallic acid; other phytochemicals that were reported to exhibit Nitric Oxide (NO) scavenging action included methyl gallate, gallic acid, geraniin, corilagin, and furosin. The water fraction of amla, or butanol extract, may have anti-inflammatory properties against stomach ulcers brought on by indomethacin [19].

9) Anti-Ageing:

Rich in vitamin C, Indian gooseberries are thought to have rejuvenating properties and are useful for avoiding aging and preserving strength as people age. It fortifies the body's defenses against infection and strengthens the heart, hair, skin, and other glands. Ageing is caused by damage to different cells and tissues, primarily from oxygen free radicals. Amla's vitamin C, which scavenges free radicals and functions as an anti-aging agent, breaks them down.

10) Immunostimulant:

Despite its many medicinal benefits, amla also has immunostimulatory effects on lymphocyte activity, especially in immunosuppressive conditions. Amla fruit pulp contains vitamin C, which stimulates the immune system. Numerous items made from amla, such as syrups, dried extracts, and tonics, have been

shown to boost immunity, give you energy, and ward off illness. Because they enhance cryoprotection and reduce DNA apoptosis and disintegration, these compounds are also referred to as immunomodulators. Amalaki churna and Amalaki swaras fruit extracts from E. officinalis have been shown to have strong pharmacological effect in addition to immunomodulatory, immunostimulant, and mild cytoprotective properties [20].

11) Hypolipidemic:
The emerging findings that several medicinal plants have immunomodulatory and lipid-lowering capabilities due to their abundant flavonoid and/or other glucose-lowering active ingredients should be scientifically examined. [21] Elderly control rats had considerably higher serum and liver lipid levels (cholesterol and triacylglycerides), but E. officinalis therapy significantly decreased these levels. In addition to considerably lowering the levels of hepatic mitochondrial thiobarbituric acid-reactive material and serum in elderly rats, oral administration of P.emblica increased the level of hepatic PPARalpha protein. These findings suggest that P.emblica may reduce oxidative stress and hence prevent age-related hyperlipidemia [22].

12) Antimicrobial activity:
Gram-positive bacteria are more susceptible to EO's antibacterial action, whilst fungi are less susceptible to its effects. When tested for Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus, Bacillus cereus, Vibrio cholerae, and Candida albicans, the EO extracts showed a high zone of inhibition (ZOI). The use of P. emblica fruit as a treatment for various microbial disorders is reflected in its antimicrobial efficacy against both Gram-positive and Gram-negative bacteria as well as fungal agents [23].

13) Antifungal activity:
At a 100% concentration, the P. emblica extract's in vitro potential against Fusarium solani, a fungus that causes dry potato tuber rot, was found to limit mycelial growth. Aspergillus candidus, A. columnaris, A. flavipes, A. flavus, A. fumigatus, A. niger, A. ochraceus, and A. tamari are the eight species of Aspergillus fungus against which the EO aqueous extract demonstrated strong antifungal activity. In this investigation, petroleum ether, chloroform, methanol, benzoene, and ethanol were among the several solvents used in the extraction procedure. When compared to the other solvents, the methanol extract of EO demonstrated the strongest antifungal efficacy [24].

14) Antidiarrheal:
Rats with castor oil-induced diarrhea and magnesium sulfate-induced diarrhea were used to test the antidiarrheal effects of phyllanthus emblica methanol extract, which significantly reduced gut motility. Additionally, it was discovered that antidiarrheal action was present at doses of 50, 100, and 150 mg/kg, respectively [25].

15) Neuroprotective:
According to a study, Phyllanthus emblica extract has a protective effect against DNA damage and is efficient in treating neurological diseases. A variety of emblica officinalis methanol extracts have been proven to be more effective and to promote cell growth and proliferation. Emblica officinalis also exhibits therapeutic efficacy for neurological illnesses and reduces oxidative stress, which suppresses tumor cells [26].

16) Anti Tussive:
By mechanically stimulating the tracheobronchial mucous region of the airways, the antitussive properties of Phyllanthus emblica were evaluated in cats. When 50 mg/kg is administered, phyllanthus emblica has cough suppressing action that is dose dependent. Together with other antioxidants like tocopherol and beta carotene, the fruit extract of Phyllanthus emblica is a high source of vitamin C, which has been shown to reduce chronic cough. At a larger dosage, Phyllanthus emblica exhibits a good ability to suppress mechanically stimulated cough [27].

III. CONCLUSION

Research on traditional Indian medicinal herbs has recently regained momentum. Despite their effectiveness, the other medical systems have a multitude of side effects that frequently result in major problems. Herbal medication solves all of these issues because it is natural. Amla, or Emblica officinalis, is a key component of Ayurveda, an Indian traditional medical practice. Because it has the highest

concentration of vitamin C and other vital nutrients, amla's biological qualities and potent antioxidant help prevent a wide range of health issues. It may be utilized in the biopharmaceutical and nutraceutical industries, as well as as a potential food additive. Numerous studies have demonstrated that different amla extracts and herbal formulations have potential therapeutic effects against a range of illnesses, with outcomes comparable to those of conventional medications. In this review, we attempted to summarize the traditional and scientifically validated uses of amla and to identify the fundamental mechanisms behind them. Despite the fact that amla has been used for centuries for a variety of medical purposes, it is imperative that its medicinal benefits be investigated scientifically and demonstrated at the molecular level using the most up-to-date biotechnological instruments and methods.

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