

EMBLICA OFFICINALIS (AMLA): A PROSPECTIVE REVIEW ON DISTINCTIVE PROPERTIES AND THERAPEUTIC APPLICATIONS OF AMLA

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ABSTRACT

Phyllanthus emblica Linn. (*Embllica officinalis* Gaertn.) usually referred as Amla is well-known tree used for the production of herbal as well as pharmacological medicines. It is a famous truth so as to every components of Amla are beneficial for the treatment of numerous illnesses. Among all, the maximum vital element is fruit. Amla fruit is extensively utilized in all around the world gadget of medication as antioxidant, hepatoprotective, nephroprotective, metabolic syndrome, cardioprotective, hair energizer, stomach ulcer protective, and sickness, as by myself or in aggregate with different herbs. The different researches show that it contains large number of biochemical components, especially alkaloids, phenols, tannins, multivitamin, and inorganic compounds. The organic chemical constituents present in Amla involve ellagic acid, gallic acid, emblicanin A and B, phyllembin, quercetin, and ascorbic acid are decided to be efficient for health. The review articles related to Amla well known its palliative, anti-coughing, anti-atherogenic, immune booster, aerobic, intestinal protective, kidney protective, and neuroprotective, chemopreventive, radio modulatory, and anticancer homes. It is also stated to possess amazing unfastened radical scavenging, oxidation inhibitor, anti-inflammatory, antimutagenic, and immune modulatory sports that are effectual inside the remedy and treatment of diverse illnesses such as cancer, atherosclerosis, diabetes, liver, and coronary heart illnesses. In this text, we communicate the nutritional fee, biochemical components, and conventional makes use of medicinal cost of Amla and its use as a household treatment. We, moreover, emphasized the mechanisms entails in pharmacological sports based on the modern-day research critiques and attempted to summarize the results of studies carried out from the beyond 5 years with proper specifications on the destiny possibilities in a pharmacological perspective.

Keywords: Amla, Conventional medicines, Coronary, Antioxidant, Treatment applications.

INTRODUCTION

Plants and herbs are mostly used to cure different diseases by developing different drugs or medicines from them (Newman *et al.*) [1]. The worldwide survey showed that ~80% of population used conventional medicines for primary health care that become suitable for remaining 20% of population [2]. In developing countries, medicinal plants are widely used for the treatment of different diseases [3]. Amla (*Embllica officinalis*) is a well-known tree used for the production of herbal as well as pharmacological medicines. *E. officinalis* trees are acid, gallic acid and phenols [4]. Mostly each commonly small or medium in size (8–18 m) and found in Pakistan, India, Sri Lanka, China and Malaysia etc. Their leaves are similar to pinnate leaves, which are simple, dull green, and stalk free; bark is thin and light gray in color; greenish-yellow-colored flowers; fruits are pale yellow in color having 6 trigonal seeds packed in three hard shells cocci. Amla contains large contents of nutrients and best origin of inorganic contents, amino acids, and ascorbic acid (Vitamin C) [5]. Some other important chemical ingredients are alkaloids, tannins, and emblicanin A and B; ellagic part of *E. officinalis* contains medicinal characteristics, especially fruits are used to cure the jaundice, diarrhea, and inflammation [5]. Amla is also used in medicine as separately or by combining it with other beneficial plants and used to cure stomach infection, liver infection, hair tonic, and to avoid from ulcer. The pharmaceutical-based reports or research articles on Amla show its pain-relieving property, free radical rummaged [6], antimutagenic property [7], anticough [8], antiatherogenic [9], adaptogens [10], cardioprotective [11], gastroprotective [12], nephroprotective [13], neuroprotective [14], and anticancer [15] properties. It is chemopreventive (Adil *et al.*, 2010; Chularojmontri *et al.*, 2013; Sandhya and Mishra, 2006) [16-18], radioprotective (Singh *et al.*, 2010) [19], and immunomodulator (Ram *et al.*, 2002) [20], All above-mentioned properties make it more

efficient in curing different diseases, i.e., cancer, diabetes, stomach ulcer, liver infection, cardiovascular diseases (CVD), and many other. The nature of current discussion is a try-out to cognize the importance of Amla according to medical point of view and its nutritional values, routine uses, and biochemical ingredients. It also reviews the research done on Amla and also describes the features of Amla that ensures its importance and uses in curing different diseases for further research in future.

CLASSIFICATION

Amla fruit

Amla fruit is nearly spherical in shape, 18–25 mm in width and 15 layers of the pericarp (i.e., mesocarp) of a fruit are yellow in color while endocarp becomes yellowish-brown in ripened state. In case of fresh Amla fruit, the mesocarp contains sour taste, while it gives puckery taste in dried fruit, 20 mm in length.

And ripen within November–February. Its surface is smooth but having six unclear vertical lines. The middle Amla leaves are >8–10 mm large, while 2–3 mm broad. They are hairless, light green in color from outside, and pale green or often pubescent beneath and commonly used as a food for catles.

Amla oil

Its fat and oil mainly obtained through seeds and fruits of Amla, and golden yellow-light brown in color. It contains light, sweet, and nutty smell. It is highly moisturizing and moderate viscous oil.

Amla seeds

Each fruit contains 4–6 seeds which smooth to touch and dark brown in color. They are better source of Amla oil. Amla seeds are commonly used to cure the asthma and bronchitis.

Amla bark**Amla extract**

Its color is normally gray-brown or gray-green and about 12 mm thick.

Amla fruit extract obtained by alcoholic extraction is very efficient in its antiviral activity.

Physicochemical properties of Amla seeds

The fruit pulp of *E. officinalis* is rich in minerals, as shown in Fig. 1. It contains high moisture content up to ~81.2%, oil contents ~0.1%, protein ~0.5%, inorganic contents ~0.7%, fiber ~3.4%, carbohydrates ~14.1%, calcium ~0.05%, phosphorus ~0.02%, iron up to 2 mg/100 g, nicotinic acid 0.2 mg/100 g, ascorbic acid (Vitamin C) 600 mg/100 g, and Vitamin B₃ 0.4 mg/100 g. Similarly, the juice of Amla fruit comprises high contents of ascorbic acid (0.47856 g/100 mL). On blending Amla fruit, among other fruits enhance amount of nutritive contents by the collective effect of fruits [22].

The leaves of *E. officinalis* are the best source of biochemical compounds such as malic acid, chebulinic acid, ellagic acid, chebulic acid, alkaloids phyllantidine, gallic acid, phyllantine, and chebulagic acid. On the other hand, the bark of Amla (*E. officinalis*) is rich in tannin, proanthocyanidin, and leukodelphinidin.

CHEMICAL CONSTITUENTS

Amla is most famous and largely studied plants. The study of research shows that it contains large number of biochemical components, especially alkaloids, phenols, and tannins [23]. Approximately 28% of tannin of entire plant exists in fruit. This tannin is present in two hydrolysable forms: (i) Emblicanin A and (ii) emblicanin B [24], which are antioxidant in nature; emblicanin A provides ellagic acid, glucose, and gallic acid on hydrolysis, but emblicanin B hydrolysis results in the formation of ellagic acid and glucose. This fruit is also a source of phyllembin [12]. The further fractionation disclosed that many other phytochemical constituents are present, i.e. geraniin, corilagin, gallic acid, and furosin [25].

Chemical constituents of *Emblica officinalis* (Amla)

POTENTIAL THERAPEUTIC APPLICATIONS

Amla possesses a number of applications in various fields.

Antioxidant

Herbs and flavors are used as spice and flavoring agent and also considered to be antioxidant in nature [27]. Amla fruit extract reveals the chemical nature and oxidation inhibiting nature. All phenolic constituents give positive responses as antioxidant and show maximum

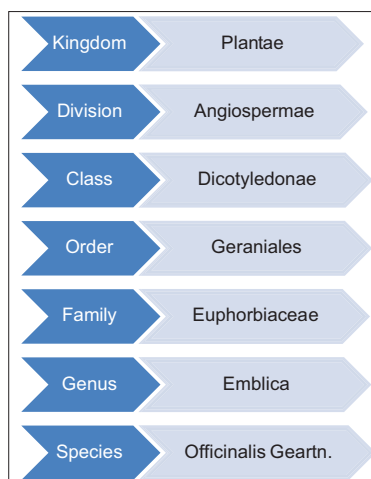


Fig. 1: Biological information about Amla (Jain et al., 2015) [21]

results for flavonoid and tannin [28]. The study of Reddy et al. [14] denoted the antioxidant nature of *E. officinalis* because of collective effects of phytophenols, flavonoid materials, and ascorbic acid [14]. Similarly, Shivananjappa et al. explained that aqueous extract of Amla fruit increases the endogenous antioxidant activity by help of a hepatocyte cell line (HepG2) [29].

Hepatoprotective

From ancient time, natural products are still used for curing the liver diseases [30]. All the chemical constituents can be separated due to which it is highly efficient hepatoprotective isolated salt medicine like modern medicine [31]. Inflammation in liver can cause liver infection. However, Amla fruit shows positive response in the treatment of liver injury because it contains excess of biochemical compounds such as Vitamin C, flavonoids, and tannins. The drugs of Amla fruit help in absorbing N-nitrosodiethylamine into the liver that acts as oxidation inhibitor, anti-inflammatory, apoptosis inhibitor, and autophagy inhibitor in nature [32].

Nephroprotective

The study about Amla also describes its efficacy against kidney infection within the body of rats which promote with aging process [13].

Hypolipidemic

Like other plants, the Amla fruit is also hypolipidemic, lipid deficient, and immune modulating in nature because of the presence of excess flavonoid or any other substances that lower the glucose [33]. Using *E. officinalis*, the levels of lipids (i.e., cholesterol and triacylglyceride) in blood can be controlled [34].



Fig. 2: Amla or *Emblica officinalis* fruit (Indian gooseberry)

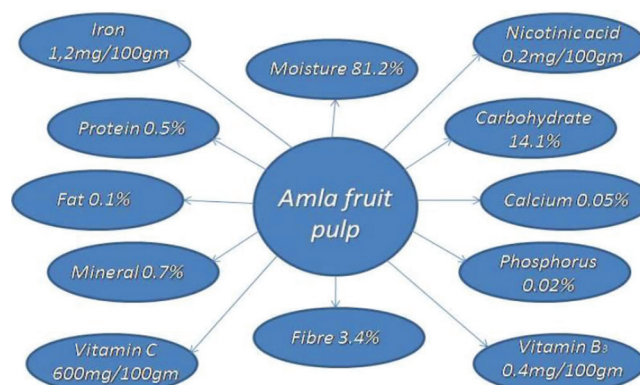
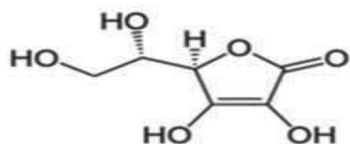


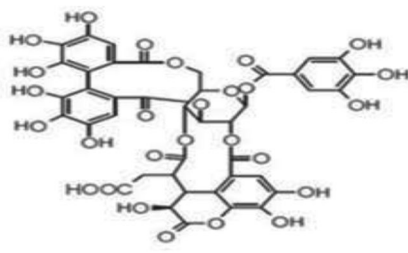
Fig. 3: Average percentage composition of Amla fruit pulp (Jain et al., 2015) [21]



Ascorbic Acid

Chem. Formula: $C_6H_8O_6$

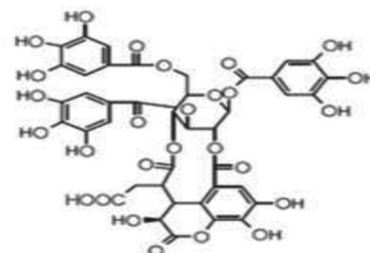
Molecular mass: 176



Chebulagic Acid

Chem. Formula: $C_{41}H_{30}O_{27}$

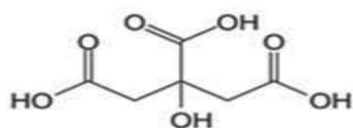
Molecular mass: 955



Chebulinic acid

Chem. Formula: $C_{41}H_{32}O_{27}$

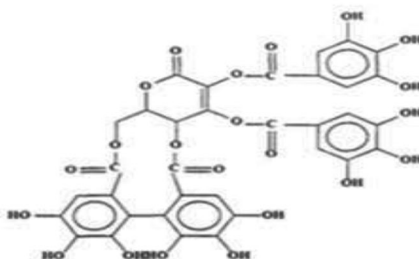
Molecular mass: 957



Citric Acid

Chem. Formula: $C_6H_8O_7$

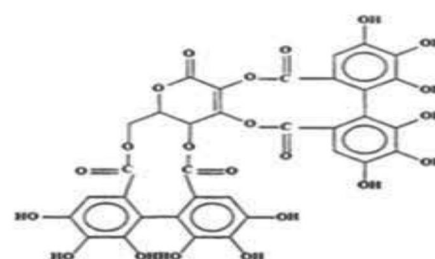
Molecular mass: 192



Emblicanin-A

Chem. Formula: $C_{34}H_{22}O_{22}$

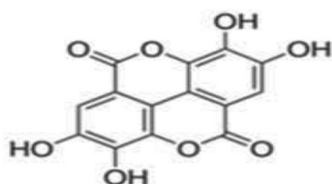
Molecular mass: 782



Emblicanin-B

Chem. Formula: $C_{34}H_{20}O_{22}$

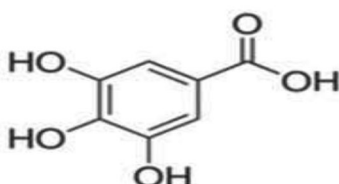
Molecular mass: 780



Ellagic acid

Chem. Formula: $C_{14}H_6O_8$

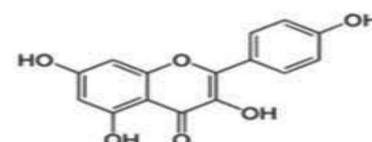
Molecular mass: 302



Gallic acid

Chem. Formula: $C_7H_6O_5$

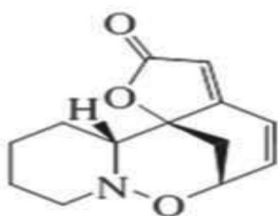
Molecular mass: 170



Kaempferol

Chem. Formula: $C_{15}H_{10}O_6$

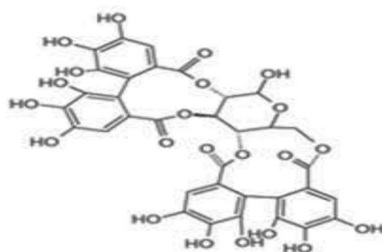
Molecular mass: 286



Phyllanthidine

Chem. Formula: $C_{13}H_{15}NO_3$

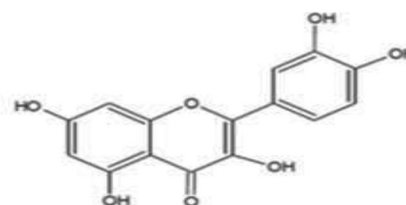
Molecular mass: 233



Pedunculagin

Chem. Formula: $C_{34}H_{24}O_{22}$

Molecular mass: 785



Quercetin

Chem. Formula: $C_{15}H_{10}O_7$

Molecular mass: 302

Table 1: Amla fruit: Chemical constituents

S. No.	Type	Chemical constituents
1.	Hydrolysable tannins	Emblcanin A and B, punigluconin, pedunculagin, chebulinic acid (ellagitannin), chebulagic acid (benzopyran tannin), corilagin (ellagitannin), and geraniin (dehydroellagitannin), ellagotannin
2.	Alkaloids	Phyllantine, phyllembin, and phyllantidine
3.	Phenolic compounds	Gallic acid, methyl gallate, ellagic acid, and trigalloyl glucose
4.	Amino acids	Glutamic acid, proline, aspartic acid, alanine, cystine, and lysine
5.	Carbohydrates	Pectin
6.	Vitamins	Ascorbic acid
7.	Flavonoids	Quercetin and kaempferol
8.	Organic acids	Citric acid

Metabolic syndrome

E. officinalis extract obtained by ethyl acetate extraction, contains the large amount of fructose-induced metabolic syndrome. This research elaborates that *E. officinalis* is rich in fraction of the polyphenol [35].

Cardioprotective

Besides the other benefits, its major advantage is protection from CVD, atherosclerosis, and other heart diseases. The remedy from atherosclerosis is possible only when the oxidation of injury or low-density lipoprotein (LDL) is minimized. The juice of Amla fruit ensured that it is rich in polyphenol amount. Moreover, the surgical pathology recovery of cardiac muscles guaranteed the preventative activity of *E. officinalis*. All the research and discussion argued that *E. officinalis* shows heart protective, antioxidant, and free radical scavenging properties [36,37].

Diabetes and related complications

Daily routine foodstuffs participate in controlling the diabetes level. Like garlic, onion, and turmeric, Amla (*E. officinalis*) shows also positive effect in lowering the diabetes level. Approximately 2–3 g of *E. officinalis* powder efficiently helps in improving the high-density lipoprotein cholesterol level and controlling the LDL cholesterol level. Furthermore, Amla fruit is also being in use to get remedy from neuropathy development, for diabetic patient [38].

Immunostimulant

As we are familiar with various plants, that are immune stimulant in nature. Similarly, Amla is the best source of ascorbic acid that enhances immunoactivity (i.e. make 2 times more effective) by stimulating immune cells and antibodies [39].

Antimicrobial

Approximately 50% and 20% of deaths are caused by infectious diseases in tropic areas and America, respectively. Chemical constituent obtained from medicinal plants is being in used to cure antimicrobial infection since over 100 years [40]. The organic solvent (such as CHCl_3 and CH_3OH) extract of Amla (*E. officinalis*) shows efficient result against few Gram-positive and Gram-negative bacteria [41]. On the other hand, Vijayalakshmi *et al.* discussed antimicrobial nature of aqueous *E. officinalis* fruit pulp extract alongside Gram-positive bacteria and Gram-negative bacteria [42]. However, in future, *E. officinalis* drugs will serve as low cost and safe medicines due to its antimicrobial activities.

Anticancer

Like other natural medicinal plant, *E. officinalis* is better for anticancer because of high concentration of polyphenol constituents in it. Polyphenols involve the mechanisms associated with anticarcinogenic effect, inflammation, and radiation retardant [43].

Table 2: Various applications of Amla (Variya et al., 2016) [26]

Natural cholesterol remedy	It strengthens the heart muscles and causes a significant decrease in total cholesterol, LDL cholesterol, VLDL cholesterol, and triglycerides. A 500 mg capsule of dried Amla powder can be added to your daily routine after consulting with doctor
Treats hypertension	High Vitamin-C helps control blood pressure. Amla churna (powder) or in the form of Triphala tablets or decoction. Triphala, a combination of Amla and two other herbs, is an excellent medication for high blood pressure
Natural cure for anemia	Amla is rich in Vitamin-C or ascorbic acid, an essential ingredient that helps in the absorption of Iron
Herbal cough remedy	Add a teaspoon of Amla juice or powder to a glass of warm milk and drink this thrice a day. This will clear an unpleasant throat, adding some ghee to this decoction will clear a cough. Mix Amla powder with honey and suck this mixture twice a day to cure a chronic dry cough. Amla is invaluable in the treatment of tuberculosis, asthma, and bronchitis
Natural eye tonic	Fresh Amla juice or dried Amla capsules are a good supplement to improve nearsightedness, cataract, and glaucoma. It reduces intraocular tension and corrects the vision
Promotes hair growth	Dried Amla fruits are boiled in coconut oil and then ground to form Amla oil. This is a very effective conditioner and prevents balding and greying of hair. For oily hair, mix half a cup of Amla juice, half a cup of lime juice and some water. Apply this to make an anti-grease hair wash
A pitta pacifier	Amla boiled in coconut water and the ground mixture is applied to the scalp. Amla oil is an excellent way to reduce heat associated with summer season. It is a good remedy to pacify pitta conditions
Treats white spots on the nails	As a source of Vitamin C, serves as an effective remedy in vitamin deficit condition. Addition of Amla juice/powder in diet overcomes this condition
Remedy for menstrual disorders	White discharge can be relieved with powdered and dried Amla seeds. Mixture of Amla with honey and saunf (fennel) or mixing it with squished banana and consuming

Osteoporosis

Amla (*E. officinalis*) fruit is very useful for strengthening the weak and fragile bones (i.e., osteoporosis). It often takes more time even several years to appear or required only diagnoses, *E. officinalis* extract is used to mature osteoclasts. Penolazzi *et al.* revealed the implement of the extracts of *E. officinalis* [44].

Gastroprotective

Amla is not only anticarcinogenic but also its phytochemical components are best for prevention gastrointestinal infection [45]. According to Mehmood *et al.*, Amla (*E. officinalis*) extract is used in the treatment of diarrhea and showed spasmolytic activities [46].

Dermoprotective

Besides the other medicinal plants, *E. officinalis* extract is very useful in skin care, antiaging, dermatological disorder since more than 20 years [47]. Amla extract protects human skin against oxidative stress because of its antioxidant nature. *E. officinalis* defends the skin from

free radical that causes skin damage. Furthermore, Amla (*E. officinalis*) is best for anti-aging and used for the production of cosmetics for skin care [48].

Eye disorders

For remedy of eye disease, *E. officinalis* and its tannoids are used which decreased the possibilities of oxidative pressure as there was a reversal of adjustments with appreciate to lipid peroxidation, carbonyl content of protein, and roles of antioxidant enzymes. Amla additionally prevented aggregation and insolubilization of lens proteins resulting from hyperglycemia [49].

CONCLUSION

Approximately 80% of the population relies in large part on conventional plant-derived capsules for their primary health care. Furthermore, many of occurring drugs obtained immediately through herbs. Moreover, for purifying herbal pills, there may be sizable marketplace for natural drugs. The consumption of native therapeutic vegetation decreases growing countries' dependence on drug imports. Thus, each herbal medicines or unfinished natural drugs ought to take the equal cost-effective pharmaceutical difficulty, which has ended up vital for latest imitative prescribed drugs. Although the alternative structures of medication are powerful, they arrive by means of some unwanted results that regularly cause critical hurdles. Herbal medicinal drug relieves a lot of the troubles, as Amla has a critical role for curing different diseases. Amla because of its greater antioxidant and biological nature saves you innumerable health issues as it includes important vitamins and particularly ascorbic acid.

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