



Emblica Officinalis (Amla): A Prospective Review On Distinctive Properties And Therapeutic Applications Of Amla

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Abstract: Phyllanthus emblica Linn (*Emblica 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, sickness, as by myself or in aggregate with different herbs. The different research shows 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 & B, Phyllembein, 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 neuro-protective, chemo-preventive, radio-modulatory and anticancer homes. It is also stated to possess amazing unfastened radical scavenging, oxidation inhibitor, anti-inflammatory, anti-mutagenic, immune-modulatory sports, that are effectual inside the remedy and treatment of diverse illnesses like cancer, atherosclerosis, diabetes, liver and coronary heart illnesses. In this text, we communicate the nutritional fee, biochemical components, 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 five years with proper specifications on the destiny possibilities in a pharmacological perspective.

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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, Cragg, & Snader, 2000). The worldwide-survey showed that ~80% of population used conventional medicines for primary health care that become suitable for remaining 20% of population (Cragg et al., 1999). In developing countries, medicinal plants are widely used for treatment of different diseases (Sharma et al., 2012). Amla (*Emblica officinalis*) is well known tree used for the production of herbal as well as pharmacological medicines. The *E. officinalis* trees are acid, Gallic acid and phenols (Zhang et al., 2003). Mostly each commonly small or medium in size (8-18m) 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 grey 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 (vit C) (Dasaroju & Gottumukkala, 2014). Some other important chemical-ingredients are Alkaloids, Tannins, Emblicanin A & B; Ellagi part of *E. officinalis* contains medicinal characteristics; especially fruits are used to cure the jaundice, diarrhoea and inflammation (Dasaroju & Gottumukkala, 2014). 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 shows its pain-relieving property, free-radical rummaged (Dinesh, Roopan, & Selvaraj, 2016), anti-mutagenic property (Perianayagam, Sharma, Joseph, & Christina, 2004), anti-cough (Nosál'ova, Mokry, & Hassan, 2003), anti-atherogenic (Jeevangi, Manjunath, & Sakhare, 2013), adaptogens (Muruganandam, Kumar, & Bhattacharya, 2002); cardio-protective (Baliga et al.), gastro-protective (Chatterjee, Chattopadhyay, & Bandyopadhyay, 2011), nephro-protective (Yokozawa, Kim, Kim, Tanaka, et al., 2007), neuro-protective (Reddy, Padmavathi, Kavitha, Gopi, & Varadacharyulu, 2011) and anticancer (Madhuri, Pandey, & Khanna, 2009) properties. It is chemo preventive (Adil et al., 2010; Chularojmontri, Suwatronnakorn, & Wattanapitayakul, 2013; Sandhya & Mishra, 2006), radio-protective (Singh, Sharma, Jindal, Soyál, & Goyal, 2010) and immunomodulator (Ram et al., 2002), All above mentioned properties make it more efficient in curing different diseases i.e., cancer, diabetes, stomach ulcer, liver-infection, cardiovascular diseases 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, biochemical ingredients. It also reviews the research done on amla and also describes the features of amla that ensure its importance and uses in curing different diseases for further research in future.

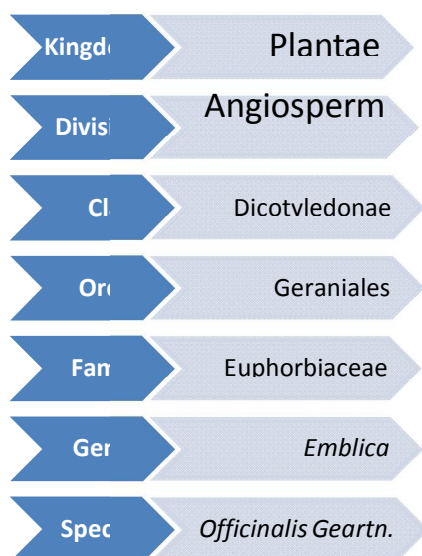


Fig. 1 Biological information about Amla (Jain, Pandey, Mahant, & Rathore, 2015)

Classification Amlafruit Amlafruit is nearly spherical in shape, 18-25 mm in width and 15- layer of the pericarp (i.e. mesocarp) of a fruit is yellow in color while endocarp becomes yellowish-brown in ripened

state. In case of fresh amlafruit the mesocarp contains sourish taste, while it gives puckery taste in dried fruit. 20 mm in length.

And ripen within November-to-February. Its surface is smooth but having six unclear vertical lines. The middle.

Amla leaves Amla leaves are \geq 8-10 millimeter large, while 2-3 millimeter 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.



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

Amla oil

Its fat and oil mainly obtained through seeds & 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 millimeter thick.

Amla fruit extract obtained by alcoholic extraction is very efficient in its anti-viral activity.

Physicochemical Properties of Amla Seeds

The fruit pulp of *E. officinalis* is rich in minerals as shown in figure 1. It contains high moisture content upto ~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 upto 2mg/100gm, Nicotinic acid 0.2mg/100gm, ascorbic acid (vitamin C) 600mg/100gm and vitamin B₃ 0.4mg/100gm. Similarly the juice of amla fruit comprises of high contents of ascorbic acid (0.47856 g per100 mL). On

blending amlafruit among other fruits enhance amount of nutritive contents by the collective effect of fruits (El-Desouky, Ryu, & Kim, 2008).

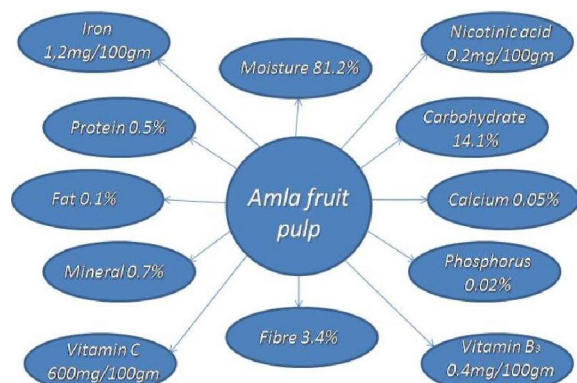


Fig. 3 Average percentage composition of Amla fruit pulp (Jain et al., 2015)

The leaves of *E. officinalis* are best source of biochemical compounds like amlic Acid, Chebulinic acid, Ellagic acid, Chebulic acid, alkaloids phyllantidine, gallic Acid, Phyllantine, 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 (Habib-ur-Rehman et al., 2007). 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 (Rajak et al., 2004), which are antioxidant in nature; Emblicanin A provides ellagic acid, glucose and gallic acid on hydrolysis, but Emblicanin B hydrolysis results in formation of ellagic acid and glucose. This fruit is also a source of Phyllembin (Chatterjee et al., 2011). The further fractionation disclosed that the many other phytochemical constituents are present i.e. geraniin, corilagin, gallic acid and furosin (Mirunalini & Krishnaveni, 2010).

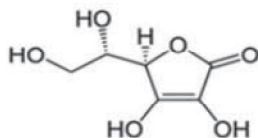
Table 1: Amla fruit: Chemical constituents.

Sr. No.	Type	Chemical Constituents
1	Hydrolysable Tannins	Emblicanin A and B, Punigluconin, Pedunculagin, Chebulinic acid (Ellagitannin), Chebulagic acid (Benzopyran tannin), Corilagin (Ellagitannin), Geraniin (Dehydroellagitannin), Ellagotannin
2	Alkaloids	Phyllantine, Phyllembin, Phyllantidine
3	Phenolic compounds	Gallic acid, Methyl gallate, Ellagic acid, Trigallayl glucose
4	Amino acids	Glutamic acid, Proline, Aspartic acid, Alanine, Cystine, Lysine
5	Carbohydrates	Pectin
6	Vitamins	Ascorbic acid
7	Flavonoids	Quercetin, Kaempferol
8	Organic acids	Citric acid

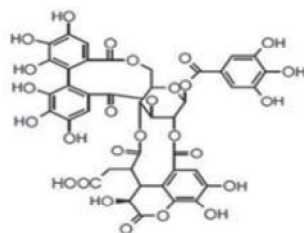
Herbs and flavors are used as spice and flavoring agent, and also considered to be antioxidant in nature (Ak & Gülçin, 2008). Amlafruit extract reveals the chemical nature and oxidation inhibiting nature. All phenolic constituents give positive responses as antioxidant and show maximum results for flavonoid and tannin (Poltanov et al., 2009). The study of Reddy *et al.*, denoted the antioxidant nature of *E. officinalis* because of collective effects of phytophenols, flavonoid materials & ascorbic acid (Reddy et al., 2011). Similarly Shivananjappa *et al.*, explained that aqueous extract of amla fruit increases the endogenous antioxidant activity by help of a hepatocyte cell line (HepG2) (Shivananjappa & Joshi, 2012).

(ii) Hepatoprotective

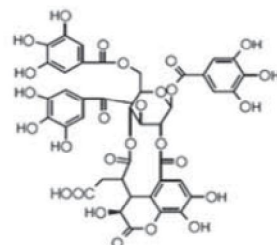
From ancient time natural products are still used for curing the liver diseases (Girish & Pradhan, 2012). All the chemical-constituents can be separated due to which it is highly efficient hepatoprotective isolated-salt medicine like modern medicine (Ghosh, Ghosh, Mandal, & Mandal, 2011). Inflammation in liver can cause liver infection. But amla fruit shows positive response in treatment of liver injury because it contains excess of biochemical compounds like vitamin C, flavonoids, and tannins etc. The drugs of amla fruit help in absorbing N-nitroso diethyl amine (NDEA) into the liver that act as oxidation inhibitor, anti-inflammation, apoptosis inhibitor, and autophagy inhibitor in nature (Golechha, Bhatia, Ojha, & Arya, 2011).

**Ascorbic Acid**Chem. Formula: $C_6H_8O_6$

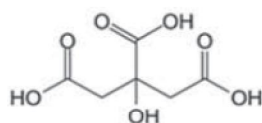
Molecular mass: 176

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

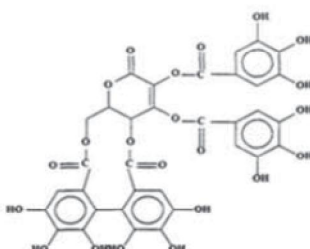
Molecular mass: 955

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

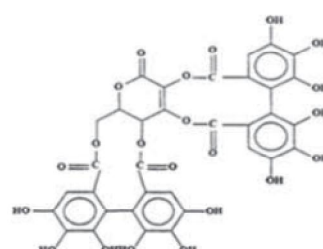
Molecular mass: 957

**Citric Acid**Chem. Formula: $C_6H_8O_7$

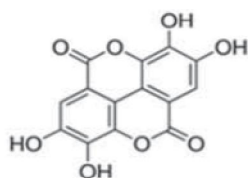
Molecular mass: 192

**Emblicanin-A**Chem. Formula: $C_{34}H_{22}O_{22}$

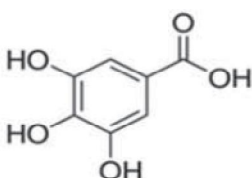
Molecular mass: 782

**Emblicanin-B**Chem. Formula: $C_{34}H_{20}O_{22}$

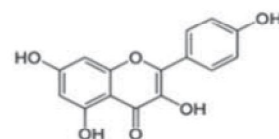
Molecular mass: 780

**Ellagic acid**Chem. Formula: $C_{14}H_6O_8$

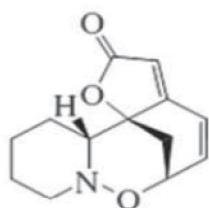
Molecular mass: 302

**Gallic acid**Chem. Formula: $C_7H_6O_5$

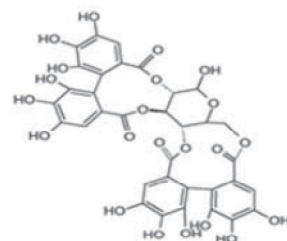
Molecular mass: 170

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

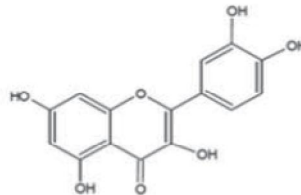
Molecular mass: 286

**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

Chemical constituents of *Emblca officinalis* (amla)

Potential Therapeutic Applications

Amla possess a number of applications in various fields.

Table 2: various applications of Amla (Variya, Bakrania, & Patel, 2016)(i) *Antioxidant*

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 choorna (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 near-sightedness, cataract and glaucoma. It reduces intra ocular 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.

(iii) *Nephroprotective*

The study about amla also describes its efficacy against kidney-infection within the body of rats which promote with aging process (Yokozawa, Kim, Kim, Tanaka, et al., 2007).

(iv) *Hypolipidemic*

Like other plants, the amla fruit is also *hypolipidemic*, lipid-deficient, and immunomodulating in nature because of the presence of excess flavonoid or any other substances that lower the glucose (Dwivedi & Aggarwal, 2009). By using *E. officinalis* the levels of lipids (i.e. cholesterol and triacylglyceride) in blood can be controlled (Yokozawa, Kim, Kim, Okubo, et al., 2007).

(v) *Metabolic Syndrome*

The *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 (Kim, Okubo, Juneja, & Yokozawa, 2010).

(vi) *Cardioprotective*

Beside 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 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 (Patel & Goyal, 2011; Zhao et al., 2008).

(vii) *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 2-3g of *E. officinalis* powder efficiently helps in improving the HDL 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 (Srinivasan, 2005).

(viii) Immuno stimulant

As we are familiar with various plants, that are immune stimulant in nature. Similarly amla is best source of ascorbic acid that enhances immuno-activity (i.e. make 2-times more effective) by stimulating immune cells and antibodies (Kumar, Gupta, Sharma, & Kumar, 2011).

(ix) Antimicrobial

Approximately 50% and 20% of deaths are caused by infectious diseases in tropic areas and America respectively. Chemical constituent obtained from medicinal plants are being in used to cure antimicrobial infection since over hundred years (Mahady, Huang, Doyle, & Locklear, 2008). The organic solvent (like CHCl₃, CH₃OH) extract of amla (*E. officinalis*) shows efficient result against few gram +ive and gram -ive bacteria (Rahman, Akbor, Howlader, & Jabbar, 2009). On other hand Vijayalakshmi discussed anti-microbial nature of aqueous *E. officinalis* fruit pulp extract alongside gram -ive bacteria and gram-negative bacteria (Vijayalakshmi et al., 2007). However, in future the *E. officinalis* drugs will serve as low-cost and safe medicines due to its antimicrobial activities.

(x) 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 (Priego et al., 2008).

(xi) 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 the *E. officinalis* extract is used to mature OCs. Penolazzi et al., reveals the implement of extracts of *E. officinalis* (Penolazzi et al., 2008).

(xii) Gastroprotective

Amla is not only anticarcinogenic but also its phytochemical components are best for prevention gastrointestinal infection (Romano, Vitaglione, Sellitto, & D'Argenio, 2012). According to Mehmood et al., amla (*E. officinalis*) extract is used in treatment of diarrhea and showed spasmolytic activities (Mehmood, Siddiqi, & Gilani, 2011).

(xiii) Dermoprotective

Beside the other medicinal plants, *E. officinalis* extract is very useful in skin care, antiaging, dermatological disorder since more than 20 years (Baumann, Woolery-Lloyd, & Friedman, 2009). 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 production of cosmetics for skin care (Datta & Paramesh, 2010).

(xiv) 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 anti-oxidant enzymes. Amla additionally prevented aggregation and insolubilization of lens proteins resulting from hyperglycemia (Suryanarayana, Saraswat, Petrash, & Reddy, 2007).

Conclusion

Approximately 80 percent 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 save you innumerable health issues as it includes important vitamins and particularly ascorbic acid.

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