

TRADITIONAL USES, PHYTOCHEMISTRY, AND PHARMACOLOGICAL ACTIVITIES OF AMLA WITH SPECIAL REFERENCE OF UNANI MEDICINE - AN UPDATED REVIEW

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ABSTRACT

Emblica officinalis, commonly known as Amla belongs to family Euphorbiaceae, is widely used for medicinal purposes in Indian traditional system of medicine (Unani, Ayurveda, and Siddha). It is well known that all parts of Amla are useful in the treatment of various diseases. Various studies on Amla suggest that it has antiviral, antibacterial, and antifungal actions. It is one among those traditional plants, which have a long history of usage as a fruit and remedy. It is amazingly effective as natural antiaging drug. It is a very effectual plant in the treatment of acidity and peptic ulcer. According to Unani literature, it possesses nutritional as well as therapeutic values, and thus, it is one of the herbal nutraceuticals. Modern literature and research studies also prove its medicinal importance. Its fruit is used traditionally as an antioxidant, immunomodulator, antipyretic, analgesic, antitussive, anticancer, and gastroprotective. It is also useful in diarrhea, dysentery, diabetes, fever, headache, mouth ulcer, hair growth, scurvy, and constipation. Phytochemical studies on amla disclosed major chemical constituents including tannins, alkaloids, polyphenol, fatty acid, glycosides, phosphatides, vitamins, and minerals. Gallic acid, ellagic acid, phyllembin, and ascorbic acid are also found to be biologically effective. Various reports show the presence of catechol, β -carotene, flavonoids, pyrogallol, superoxide, and dismutase enzyme in *Emblica* fruit. In this review, an attempt is made to explore the complete information of *E. officinalis* including its phytochemistry and pharmacology.

Keywords: Antioxidant, *Emblica officinalis*, Unani.

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INTRODUCTION

From the ancient times, plants have been served as a key role for amelioration of humankind presenting as an exceptional source of natural drugs [1]. Herbal-derived medicine has made a large contribution to human health and well-being. The plants also act as a source of inspiration for the development of novel drug compounds, as plant-derived medicines have made large contributions to human health and well-being [2]. According to the World Health Organization (WHO), traditional medicine has established and proved to possess promotive, preventive, curative, and rehabilitative roles [3]. Approximately 80% of world populations depend on traditional medicine for their primary health care and play an important role in the health-care system due to lesser side effect and better acceptability [4]. The WHO is promoting, encouraging, and facilitating the effectual use of conventional medicine for the health program in developing countries. Mankind started using plants products and plants successfully as a source for the treatment of disease and injuries as effective medicinal tool from the early days of civilization to modern age [5]. At ancient times, people were living long in comparison to present time because they were more habitual to nature. They used to work hard and were taking pure and natural edible things [6]. At present time, people are suffering from so many diseases because they are getting away from the natural way of life. We should adopt a correct method of diagnosis which could prevent the people from many diseases [7]. Research in medicinal plants has achieved a renewed focus recently. A large number of medicinal plants are available in the Indian traditional system of medicines (such as Unani, Ayurveda, and Siddha) and one of them is amla or Indian gooseberry, also known as *Emblica officinalis* Linn. [8]. It is herbal medicine that inspires the herbalist due to its renowned medicinal and nutritional effects [9]. *E. officinalis* is a precious gift of nature to mankind. It is a wonder herb and indispensable part of the Unani system with amazing medicinal qualities. It is known as "Divya" in Ayurveda which literally means fruit of heaven or nectar fruit. It is also called as the sustainer or the fruit where the Goddess of prosperity resides [10]. According to

believe in ancient Indian mythology, it is the first tree to be created in the universe [11]. It belongs to family Euphorbiaceae. It is an angiosperm of the order Euphorbiales and family Euphorbiaceae. The tree is small to medium in size, deciduous, reaching 8 to 18 m in height. The leaves are simple, subsessile while flowers are greenish-yellow. The fruit are spherical with six obscure vertical furrows [8,12]. It is native to tropical and Southeast Asia, particularly found in Central or Southern India, Pakistan, Bangladesh, Sri Lanka, Malaya, Southern China, and Mascarene Islands. It has been grown in India for more than 3500 years. In eastern and western hills of India, three species, namely *Phyllanthus emblica*, *Phyllanthus acidus*, and *Phyllanthus indofischeri*, are commonly found [13]. In traditional system of medicine, amla is one of the most extensively used plants. According to Unani literature, it is used alone or in combination with other drugs as compound formulation such as Itrifalat, Jawarish Amla, Jawarish shahi, and Anushdaru [14]. having a function of Muqawwe dimagh, (Brain tonic) Muqawwe basar, (Eye tonic) jali, (Detergent) Kasire Riyah, (Carminative) Mohallil (Anti-inflammatory) etc., [14-17].

Amla has undertaken preliminary research demonstrating *in vitro* as antiviral and antimicrobial properties [18]. *Emblica* fruit is reported to have anti-inflammatory [19,20], analgesic [3], antioxidant [21], antihyperlipidemic [22], hypolipidemic [23], anticancer [24,25], hepatoprotective [26,27], apoptogenic [28], antipyretic [3], antibacterial [29], and antidepressant activities [30].

Distribution and habitat

The plant is small or middle-sized deciduous tree with smooth greenish exfoliated bark commonly found throughout the greater part of India, Ceylon, Malaya, and China [14,15,31] reaching a height up to 45 ft on the hills. It is often cultivated in gardens and home yards [31]. It is usually propagated by seeds or may also be propagated vegetatively by budding, cutting, and inarching. The plant is sensitive to frost and drought. The tree coppices well and coppices shoots grow vigorously. Flowers usually appear in the hot season and fruit ripen during the

following winter. In some parts of Madaras, flowering is observed in July and February, but the second bloom does not yield a sizable crop [31].

Taxonomical classification (United States Department of Agriculture) [32]

| Kingdom | Plantae |
|---------------|--------------------|
| Subkingdom | Tracheobionta |
| Superdivision | Spermatophyta |
| Division | Magnoliophyta |
| Class | Magnoliopsida |
| Subclass | Rosidae |
| Order | Euphorbiales |
| Family | Euphorbiaceae |
| Genus | <i>Emblica</i> L. |
| Species | <i>Officinalis</i> |

Vernacular names [14,31,33-35]

| | |
|----------|---|
| Arabic | Ambliy, Amlaj |
| Persian | Amelah, Amuleh |
| Urdu | Anwala, Aamla |
| Bengali | Ambolati, Amla, Amlakim, Amlati, Anulati, Anulah, Anvurah, Anwerd, Aonla, Aunra |
| English | Emblic, myrobalan tree, Indian goose |
| Gujarati | Amali, Ambala, Ambri, Amla, Bhoza, Bhozaamali |
| Hindi | Amalaki, Amla, Amlika, Anola, Anuli, Anvula, Anvurah, Aunra, Daula |
| Kannada | Amalaka, Nelli |
| Marathi | Anvala, Aonli, Avola, Bhuiawali |
| Oriya | Amlaki |
| Punjabi | Ambal, Ambli, Ambul, Amla, Aonla |
| Sanskrit | Adiphala, Amalaki, Amraphala, Amrita, Bahuphala, Dhatriphala, Karshaphala, Triphala |
| Tamil | Amalagam, Andakaram, Indul, Kattunelli, Perunelli, Nelli, Tattri, Sivottam |
| Telugu | Amalakamu, Amalaki, Nelli, Pullayusirika, Triphalamu, Usirika, Usirikaya, Usirki |

Morphology

Macroscopic characteristics

The leaves are subsessile, 10–13 mm × 2.5–3 mm, closely set along the branchlets, distichous, light green, glabrous, narrowly linear, resembling pinnate leaves [14,15]. The fruit is 1.3–1.6 cm in diameter, fleshy, globose with 6 obscure vertical furrows, green, and it tends to light yellow or brick-red color when mature [15,31]. Flower is greenish-yellow, refrigerant, and aperients, in axillary fascicles on the leaf-bearing branchlets, often on the naked portion below the leaves, with fimbriate bracts at the base. Male flowers are numerous with short slender pedicels while female flowers few subsessile. Disk is three-celled, styles connate at the base. The seed is acrid, sweet [15].

Microscopic characteristics

The transverse section of the leaf shows a bifacial structure. The upper epidermal cell is single-layered, tangentially elongated cells covered by thin cuticle. Mesophyll is differentiated into palisade and spongy layer. Palisade cells are single layered, vertically elongated and have a length of approximately 44–50 u. Spongy parenchyma consists of 5–6 layer of parenchymatous cells with many intracellular spaces. Some cells contain rosette-shaped crystals of calcium oxalate having diameter 18–22 u. Lower epidermis is characterized by the presence of paracytic type of stomata. All the cells give a positive test for tannin. No trichomes or hairs present on either surface. Transverse section through the mid-rib region shows collateral bundles in the center with xylem toward ventral side and phloem toward dorsal side. Crescent-shaped arms of lignified fibers present below the vascular bundle [14].

Temperament (Mijaz)

- Cold¹ and Dry² [14,16,17]
- Cold² and Dry⁴ [34]
- Cold² and Dry³ [35].

Parts used

- Dry and fresh fruit, leaves, root, bark, flower, fruit [17]
- Seed [14].

Doses

- 10.5 g [16]
- 5–10 g [14]
- 6 g [34].

Adverse effects (Muzir asrat)

It produces constipation and colic. It has harmful effect on bladder [17] and spleen [34].

Substitutes (Badal)

Halaila Kabuli (*Terminalia chebula*), Halaila siyah (*Terminalia chebula*), Asaroon (*Valeriana wallichii*) [17], Halaila Kabuli (*Terminalia chebula*) [34].

Correctives (Musleh)

Asal (Honey) [36], Almond oil, (*Prunus amygdalus*) Ishq pecha (*Ipomea quamoclit*), Balchhad, Sharbat injeer [17]. Aab lablab [16]. Asal (Honey), Almond oil. (*Prunus amygdalus*) [34].

Compound formulations

Itrifal muqawwi dimagh, Itrifal kishneezi, Jawarish Amla, Jawarish Shahi, Majoon najah, and Anashdaru [14].

Pharmacological actions

- Mulayin (laxative) [15]
- Mudirre baul (diuretic) [15]
- Jali (detergent) [16]
- Qabiz (constipative) [15]
- Mobarrid (cooling) [15]
- Kasire riyah (carminative) [15]
- Man qai (antiemetic) [17]
- Daf Khafqan (palpitation) [16]
- Daf Humma (antipyretic) [15]
- Mohallil (anti-inflammatory) [15,16]
- Muharrik-e-Baah (sexual stimulant) [16]
- Muqawwi bah (aphrodisiac) [15]
- Mulattif (demulcent) [16]
- Muqawwi aam (general tonic) [16]
- Muzaiyade mani (semen producing) [17]
- Muqawwi basar (vision improving) [16,17]
- Muqawwi dimagh (brain tonic) [14,33,37]
- Muqawwi lissa (gum tonic) [17]
- Muqawwi jigar (liver tonic) [17]
- Musakkin atash (relieving excess thrust) [17]
- Habis e ishal (antidiarrhoeal) [17]
- Mufarrah Muqawwi qalb (cardiac exhilarant and tonic) [17]
- Musaffi dam (blood purifier) [14,17]
- Muqawwi meda (stomachic) [17,33,37,38]
- Musawwade shar (hair blackening) [16,17,39]
- Mushtahi (appetizer) [15,17]
- Habis wa Qabiz (astrigent) [14,15,17,33,36,37,39]
- Taqwiate Hifz (memory enhancing) [16,17]
- Zof ama (weakness of intestine) [16,17].

Therapeutic uses

- Khafqan (palpitation) [16,17,39,40]
- Baul fil ferash (nocturnal enuresis) [16,17]
- Bayaz chashm (opacity) [16]
- Bawasir (piles) [15-17,39]

- kasrat loaab (excessive salivation) [17]
- Sailanur raham (leucorrhoea) [15,17]
- Qai (vomiting) [15-17]
- Sara (epilepsy) [17]
- Nazfud Dam (hemorrhage) [16,39]
- Suzaak (gonorrhoea) [17]
- Bilkhora (alopecia) [14,17]
- Aphthous ulcer [14]
- Hirqat baul (burning micturation) [15,16]
- Nisyan (amnesia) [16,39]
- Ashob chashm (conjunctivitis) [31,39]
- Hamuzat medi (hyperacidity) [16]
- Sual (cough) [15,17,41]
- Sue hazm (indigestion) [14]
- Qabz (constipation) [15-17,35,39]
- Atash (excessive thirst) [15-17]
- Zof qalb wa dimagh (weakness of the heart and dimagh) [16,17,35,40]
- Daul haiya (hair falling) [16,17]
- Nazfuddam (hemorrhage) [16,17,39]
- Ishaal (diarrhea) [14,16,17,39,40]
- Surkhbada (erysipelas) [15,41]
- Nakseer (epistaxis) [16,17,42]
- Shabkori (night blindness) [43]
- Zaheer (dysentery) [14,16,17,44]
- Faqrudam (anemia) [15,44-46]
- Malinkholia wa Saudawi Amraaz (melancholia and black bile disorders) [16,17]
- Falij (paralysis) [16,17]
- Zof ishteha (lack of appetite) [16,17]
- Yarqaan (jaundice) [16,17,41,45-48]
- Kasrat loab (excessive salivation) [16,17]
- Laqwah (facial paralysis) [61,17]
- Juzam (leprosy) [15,41]
- Muqallil baul (anuria) [15]
- Margazeede (snakebite) [15]
- Suzak (gonorrhoea) [15]
- Leucorrhoea [15,17,41]
- Hair falling and graying of hair [16,17].

Phytochemical constituents

The active ingredient that has significant pharmacological action in amla is designated by Indian scientist as "Phyllemblin" [10].

The fruit is rich in Vitamin C, quercetin, phyllaemblic compounds, gallic acid, flavonoids, pectin, ellagic acid, terpenoids, alkaloids, flavonoids, tannins, and glucose and its molecule [10,31].

The root contains ellagic acid and lupeol [18].

The seeds yield a fixed oil, phosphatides, and a small quantity of essential oil. The fixed oil yields 16% and has the following physical and chemical characteristics: Acid insoluble values (12.7%); acetyl value 2.03; unsaponifiable matter 3.81%; sterol 2.70%; saturated fatty acid 7%; linolenic acid (8.78 %); linoleic (44%); oleic (28.40%); steric (2.15%; palmitic (3.0%); and myristic (1.0%), and lipolytic enzymes are present in the seed [10,18,31]. The phytochemicals of this plant include hydrolysable tannins (emblicanin A, emblicanin B, punigluconin, and pedunculagin), flavonoids (kaempferol-3-O-alpha-L-(6" methyl) rhamnopyranoside and kaempferol-3-O-alpha-L-(6" ethyl) amnopyranoside), alkaloids (phyllantidine and phyllantine), gallic acid, ellagic acid, 1-O-galloyl-beta-D-glucose, 3,6-di-O-galloyl-D-glucose, chebulinic acid, quercetin, chebulagic acid, and corilagin together with isostrictinin, which were isolated from the fruit of *P. emblica*. A new acylated glucoside was isolated from the methanolic extract of the leaves of *P. emblica*. Their structures were named as apigenin 7-O-(6"-butyryl-beta)-glucopyranoside, along with four known compounds, namely gallic acid, methyl gallate, 1,2,3,4,6-penta-O-galloylglucose, and luteolin-4'One oheperiodoside. The seed of *P. emblica* contains fixed oil,

phosphatides, and small quantity of essential oil [10].

The leaves contain gallic acid, ellagic acid, chebulic acid, chebulinic acid, chebulagic acid, a gallantonic called amlic acid, and alkaloids (phyllantidine and phyllantine) [18].

The bark contains leukodelphinidin [10], tannin, and proanthocyanidin [18].

Pharmacological studies

- Analgesic activity [3]
- Memory enhancing activity [49]
- Anti-inflammatory activity [3,19,20]
- Antimicrobial activity [18,50,51]
- Antioxidant activity [13,21,52-60]
- Antibacterial activity [29,56,61]
- Antipyretic activity [3]
- Antitumor activity [55]
- Antidepressant activity [9,30]
- Antiproliferative activity [21]
- Anticancer activity [25,26,55,62]
- Antidiarrheal and spasmolytic activity [63,64]
- Antidiabetic activity [22,65-67]
- Antifungal activity [12,68,69]
- Antiviral activity [24,26,70]
- Immunomodulatory activity [71-73]
- Gastroprotective activity [74]
- Hepatoprotective activity [26,27,75,76]
- Nephroprotective activity [77]
- Oxidative stress activity [78]
- Antiepileptic activity [79]
- Dyslipidemic activity [80]
- Protective activity [81]
- Apoptogenic activity [28]
- Antiproliferative activity [21]
- Hypercholesterolemic activity [82]
- Anticandidal activity [83]
- Diuretic activity [84]
- Venom neutralizing activity [85,86]
- Larvicidal and mosquitocidal activity [87]
- Antidandruff and hair strengthening activity [88]
- Antihypertensive activity [89]
- Chondroprotective activity [90]
- Cytotoxic activity [51]
- Antiulcer activity [91].

CONCLUSION

The fitness and healthy look have become a religion for the present generation. Research on medicinal plant has achieved a new recommence in this era. Plant-based system of medicine being natural does not pose a serious problem. *E. officinalis* has an important position in the Unani System of Medicine. Due to its strong antioxidant and biological properties, It protects from many diseases due to its strong antioxidant and biological properties as it contains highest amount of Vitamin C as well as essential nutrients. In this review, we tried to make a summary on traditionally and scientifically proven uses of amla. Although amla has a various medicinal properties since ages, there is a colossal necessity to evident and explore its medicinal values at molecular levels with the help of latest techniques and biotechnological tools. It is considered to be safe herbal medicine without any adverse effect, so it can be concluded that India gooseberry is a traditionally and clinically proven fruit for both its efficacy and application.

AUTHORS' CONTRIBUTIONS

Masihuddin: Work design, data collection, analysis, drafting article, writing manuscript, and critical revision of the article. Prof. M.A Jafri: Design of the work, data analysis, critical revision of the article, and final approval of the version to be published. Dr. Aisha

Siddiqui: Data analysis and critical revision. Dr. Shahid Chaudhary: Data analysis and critical revision.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest associated with this article.

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