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A review on phytochemical perspective of *Emblca officinalis*

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Abstract

Nature has blessed human society with various herbs for a healthy life. *Emblca officinalis* or Indian gooseberry is one of the most important gifts of nature having excellent nutritional and medicinal value since the ancient time. In Ayurveda and Unani medicine system this plant possessed a great importance. Various bioactive compounds such as gallic acid, ellagic acid, chebulinic acid, quercetin, apigenin, corilagin, methyl gallate, luteolin, isostrictinin etc are present in different parts of this plant which enhances its therapeutic value. Antioxidant property of *Emblca officinalis* is responsible for removal of free radical and to protect from severe diseases. The present review is based on photochemistry of *Emblca officinalis* to study the different phytochemical present in this plant and their role in the treatment of various ailments.

Keywords: *Emblca officinalis*, bioactive compounds, therapeutic value, pharmacological activity, ethno-medicine

Introduction

Emblca or Indian gooseberry is broached as wonder plant or as divine medicine. It is a native of tropical India and South East Asia (Barthakar and Arnold, 1991) [6]. The value of this herb has been recognized before the beginning of civilization. This fruit is reputed as time immemorial, because of its nutritional, commercial and medicinal significance (Goyal *et al.*, 2007) [12]. *Emblca* is loaded with several bioactive compounds including phenolic compounds, saponins, terpenoids, ascorbic acids, carbohydrates, tannins etc. (Khan, 2009) [17]. Various patent medicines and several herbal products have been prepared using *Emblca* as an ingredient (Rai, *et al.*, 2012) [24]. In Ayurveda, the Indian traditional medicine system which forms the foundation of modern pharmaceutical world, this herb is used as a *rasayna*. This fruit contains all five *rasas* (taste) viz., *amla* (sour), *madhura* (sweet), *tikta* (bitter), *kashaya* (astringent) and *katu* (pungent). The cures of various diseases are possible through this single fruit. This fruit is recognized as an antiscorbutic, laxative, antibiotic, cooling, and diuretic. Indian gooseberry fruit is recognized as antioxidant, hypolipid (Anila and Vijaylakshmi, 2003) [2], hypoglycemic and anti-inflammatory (Perianayagam, 2004) [24]. From the ancient period this fruit is reputed for curing various diseases like anemia, scurvy, diabetes, tuberculosis, bronchitis, memory loss, cancer, stress, grayness of hair, influenza etc. The fruit is valued having highest amount of ascorbic acid up to 700 mg/100gm next after Barbados cherry. Phyllembin present in its fruit has recorded as mild depressant for nervous system. The industrial demand of this fruit crop is rising day by day to formulate various health care products and other products like hair oil, dye, shampoo, tooth paste, face cream etc.

Vernacular Name of *Emblca officinalis*

- Indian nane- Dhatri, Adiphala (Sanskrit), Aonla (Hindi), Nelli, Malanelli (Tamil), Amalakkamu, Usirikai (Telugu), Amalak, Bettadanelli (Kannada), Amali, Ambala (Gujarathi), Amla, Amlaki (Bengali), Nelli (Malayalam)
- English name- Indian gooseberry
- Italian-Mirabolano emblico
- German-Amla
- French-Phyllanthe emblica
- Tibetan-Skyu-ru-ra
- Malaysian-Popok Melaka
- Chinese- An Mole

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Morphology of *Emblica officinalis*

Tree habit- Deciduous tree, 8-18m tall, light grey bark, average girth of main stem 70cm.
Leaves- 10-13 mm long, 3 mm wide, closely set in pinnate fashion, develop after fruit setting.
Flowers- unisexual, 4-5mm in length, pale green color, develop in leaf axils in clusters of 6-10.
Fruit- fleshy, depressed to globose shape, 2.1-2.4cm diameter, 5.3-5.7 gm in weight, 4.5-5 ml in volume.
Fruit stone- 6 ribbed, splitted in 3 segments, each segment usually contain 2 seeds, seeds are 4-5 mm long, 2-3 mm wide, seed weight: 572-590 mg.

Chemical Composition of Aonla

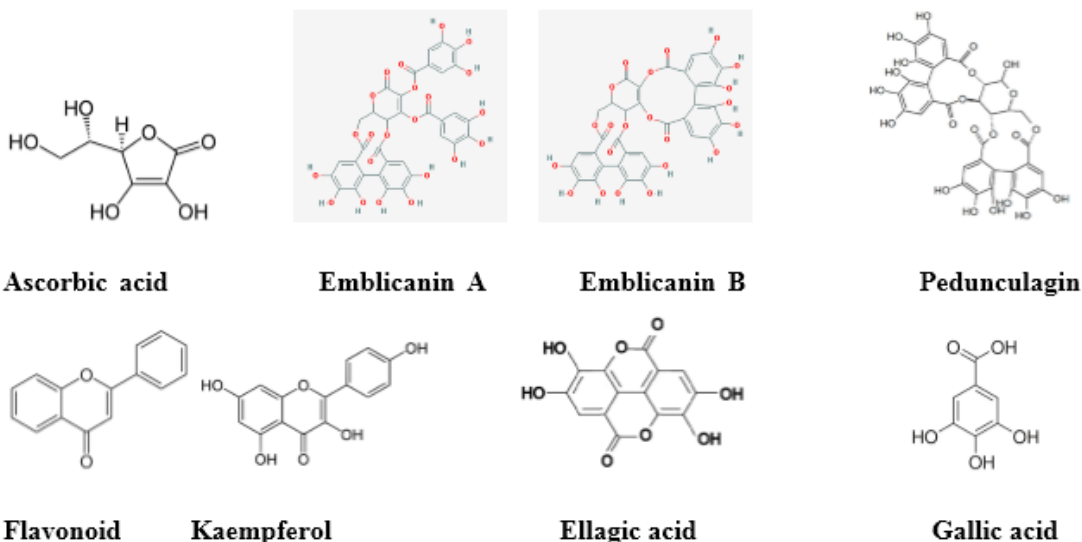
Component	Content/100gm
Moisture	77.1-81.2%
Protein	0.50%
Fat	0.05-0.10%
Minerals	0.5-0.7%
Fiber	1.9-3.4%
CHO	14.10%
Ca	15mg
Fe	1-2mg
P	21mg
Nicotinic acid	0.2mg
Carotene	0.01mg
Thiamine	0.03mg
Riboflavin	0.05mg
Niacin	0.18mg
Tryptophan	3.00mg
Methionine	2.00mg
Lysine	17.00mg

Source: Khan 2009^[17], Kavita *et al.* 2013^[19], Hasan *et al.* 2016^[15], Sachan *et al.* 2013^[27].

Photochemistry

The whole plant of *Emblica* is used in drug formulation and herbal cosmetic preparations, as it contains several bioactive substances. These compounds include- Gallic acid, ellagic acid, chebulinic acid, quercetin, apigenin, corilagin, methyl gallate, luleolin, isostrictinin etc. The tannin present in *Emblica*- glutamic acid, aspartic acid, alanine, praline and lysine are 29.6%, 8.1%, 5.4%, 14.6% and 5.3% respectively (Kumar *et al.*, 2012)^[18]. The whole plant of aonla is used for medicinal purpose as its all parts contain such bioactive

compounds. This fruit is known to contain high amounts of ascorbic acid (vitamin C), up to 700 mg per 100 g and a good source of phenolic (Zhang *et al.*, 2000; Anila and Vijaylakshmi, 2000)^[28, 1]. The bitterness of *Emblica* possibly derive due to high density of ellagitannins, such as emblicanin A (37%), Emblicanin B (33%), Punigluconin (12%) and Pedunculagin (14%). It also contains punicafolin and Phyllanemblinin A, Phyllanemblinin other polyphenols, such as flavonoids, Kaempferol, ellagic acid, and gallic acid.



Plant Part	Bioactive compounds
Fruit	Gallic acid- 1.32%, albumin-13.08%, crude cellulose-17.08%, mineral-4.12%, moisture- 3.83% Fruit ash- Chromium- 2.5 ppm, Zn- 4ppm, Cu- 3ppm
Leaves	Gallic acid, chebulic acid, ellagic acid, chebulinic acid, alkaloids
Seed	Fixed oil and essential oil, linolenic acid, linoleic, oleic, palmitic and steric acid
Barks	Leucodelphinidin, tannin and proanthocyanin
Roots	Ellagic acid, lupeol

Khan, 2009^[17]; Pareek 2012^[22]; Kumar *et al.* 2012^[18].

Classification of bioactive compounds present in aonla

Class	Bioactive compounds
Benzoic	Gallic acid, chebulic acid, chebulinic acid, ellagic acid, 3,6 di-o-galloyl glucose, b-glucogallin, digallic acid, phyllemblic acid
Alkaloid	Phyllantine, phyllantidine, zeatin, zeatin nucleotide, zeatin rioside
Diterpene	Gibberellins A-1,3,4,9
Diterpene	Lupeol
Flavonoid	Kaempferol, Leucodelphinidin, ruin
Sterol	Beta-sitosterol
CHO	Glucose
Lactone	Ascorbic acid

Ethno medicinal value of *Emblica*

Ayurvedic and Unani medicine system proved *Emblica* as a wonder plant due to its wider contribution in all herbal drug formulations. This fruit contains carminative, stomachic, laxative, aphrodisiac, antipyretic, rejuvenative property and good for diabetic patient. *Emblica* is used to cure liver

enlargement, headache, diarrhea, flatulence, dysentery and jaundice (Goyal *et al.*, 2007) [12]. The all parts of this plant are useful in drug formulation. Leaves are aphrodisiac, antipyretic and effective in asthma, bronchitis and vomiting. Its root, bark and fruit are astringent whereas, flowers are refrigerant and aperients (Gaire and Subedi, 2014) [10].

Traditional uses of *Emblica*

Hypertension	Vitamin C is helpful to control blood pressure. <i>Triphla</i> (aonla, harad, baheda) is very effective against hypertension
Anemia	Ascorbic acid present in <i>Emblica</i> enhances the absorption of iron
Cholesterol	<i>Emblica</i> strengthens the heart muscles, by consuming it in daily routine cholesterol level decreases significantly
Cough	Taking <i>Emblica</i> decoction with other ingredients like milk, honey or ghee effective in throat problems
Menstrual disorders	Mixture of <i>Emblica</i> , <i>Terminalia bellirica</i> , honey and fennel or dried seed powder gives relief.
Hair growth	Very effective for hair problems, used as a natural conditioner, using with coconut oil or lemon juice is effective to promote hair growth
Eye tonic	Fresh juice or its capsules improves vision and improve cataract and glaucoma
Hiccup and respiration problem	Its juice or fruit extract with <i>pipli</i> gives relief
Nausea and vomiting	Powder of amla seed and red sandal wood with honey is used
Doshas	All three doshas – <i>vata</i> , <i>pitta</i> , <i>kapha</i> are controlled by its consumption
As a vermifuge	Its juice with honey is used as vermifuge
Diarrhea and Dysentery	Decoction of fruit with <i>Terminalia chebula</i> and <i>Terminalia bellirica</i> is effective
Jaundice	Fermented liquor prepared from roots is used
Diabetes	Seed infusion is used

Formulations of *Emblica officinalis*

- Triphala (mixture of Amla, *Terminalia chebula* and *T. bellirica*)
- Eu-Mil
- Kalpaamruthaa
- Dhatri lauha
- Chwyanprash
- Aonla powder
- Immu-21
- Pepticare
- Brahma rasayna
- Madumegha churna

Therapeutic importance of *Emblica*

Phenolic compounds present in *Emblica* have lots of potential to inhibit different stages of carcinogenesis. Various bioactive compounds derived from fruit, branches, leaves and root inhibit the cell growth. A glycoside derived from its roots i.e., nor-sesquiterpenoid exhibit antiproliferative activities. Bioactive compounds *viz.*, flavonoids, phenols, saponins, tannins obtained from *Emblica* showed a significant antimicrobial activity (Javale and Sabnis, 2010) [16]. Phenolic compounds develop a complex with bacteria's cellular proteins or its cell wall therefore the membrane of bacteria is disrupted (Ganguly, 2003) [11]. Its dried bark is effective against mouth diseases and gastrointestinal disorders (Brun *et al.*, 1987) [9]. The water fraction of *Emblica officinalis* fruit containing butanol extract has the potential anti-inflammatory

efficacy against indomethacin induced-gastric ulcer (Bandhyopadhyay *et al.*, 2000) [5]. The antioxidant property of this fruit makes it effective cardio protective agents (Bhattacharya, 2002) [8]. It is also reported that *Emblica* has strong hepatoprotective efficiency against carbon tetra chloride caused hepatic damage (Gulati, *et al.*, 1995) [13] and also possess antipyretic and analgesic activities (Khan, 2009) [17]. *Emblica* which contains high vitamin C, gallic acid, flavonoids and tannins protect against liver injury. N-nitrosodiethyl amine (NDEA) induced liver injury (Bhandari and Kamdod, 2011) [7]. Methanolic extract of this plant had significant anti-ulcer activities (Sairam, 2002) [25] as well as free radical scavenging activity (Mehrotra *et al.*, 2011; Hazara *et al.*, 2010) [20, 14]. This plant contains antihyperlipidemic, hypolipidemic and anti-atherogenic effect (Santoshkumar *et al.*, 2013) [26]. Other effects of this fruit include anti-tussive, immunomodulatory, antimutagenic, anti-tumor, neuroprotective, anti-venom and etc. activities. Ellagic acid a strong antioxidant compound is effective against chromosomal abnormalities and inhibits gene mutations.

Antioxidant and Anticancer efficacy of *Emblica officinalis*

Emblica is reported to have greater antioxidant activity (Antony *et al.*, 2006) [3] which make this plant effective against cancer. The major disease in our body including cancer is related with hemostasis balance in body i.e. the imbalance between pro-oxidant and anti-oxidant. Pro-oxidation condition generates either due to higher free radical formation or poor scavenging activity of body. To prevent

deleterious effect of free radicals, a balance between them is necessary. Anti-oxidants are the compounds that prevent the oxidation of other molecules by inhibiting oxidizing chain reaction. Free radicals are responsible for some serious disorders like, cardiovascular disease, neuro-degeneration, atherosclerosis, diabetes, cancer, cataract and etc. (Aruoma, 1998) [4].

Triphala, a formulation of *Emblica* reported having potential as chemo preventive. Gallic acid, a polyphenol present in *Triphala* showed significant effect in the suppression of the growth of cancer cells. *Emblica officinalis* is the one of the richest source of vitamin C and other low molecular weight hydrolysable tannins available in this fruit makes it a good anti-oxidant. This fruit is effective to prevent different forms of cancers such as, breast, uterus, pancreas, liver and protect against harmful effects of chemotherapy and radiotherapy (Bhattacharya, 2002; Pandey *et al.*, 2011) [8, 21]. Gallic acid derived from fruit pulp and seed contains excellent antioxidant property and effective as free radical scavengers.

Biological activities of major compounds present in *Emblica officinalis*

Compound	Molecular formula	Biological activity
Emblicanin A	C ₃₄ H ₂₂ O ₂₂	Antioxidant activity
Emblicanin B	C ₃₄ H ₂₂ O ₂₂	Antioxidant activity
Ellagic acid	C ₁₄ H ₆ O ₈	Radiopreventive, chemopreventive, antioxidant, antiproliferative, antatherogenic activities
Gallic acid	C ₇ H ₆ O ₅	Radiopreventive, chemopreventive, ant carcinogenic, antioxidant, antimutagenic, anti-inflammatory activities
Phyllantidine	C ₁₃ H ₁₅ NO ₃	Neuropharmacological
Pedunculagin	C ₃₄ H ₂₄ O ₂₂	Antitumor, antioxidant activity
Quercetin	C ₁₅ H ₁₀ O ₇	Hepato protective, radiopreventive and chemopreventive effect

Conclusion

Various synthetic drugs have been entered the pharmaceutical field but due to their side effects as well a high prices now people once again relying more on herbal drugs and this trend is rising again. Indian gooseberry or *Emblica officinalis* is reputed as a divine medicine in Ayurveda due to its versatile nutritional and medicinal properties. The popularity of this plant to cure various diseases existed from the dawn of human civilization. This plant is known as wonder plant of nature. As it is a source of several biochemical compounds including tannins, flavonoids, alkaloids, sterols and other polyphenols which are responsible for proper metabolization, controlled oxidation reaction and other cellular functions of body. Antioxidating property of *Emblica* prevents the occurrence of cancer and other major diseases due to removal of free radicals. Therefore, *Emblica officinalis* deserves much more attention in pharmaceutical world as it is loaded with several nutrients and phytochemicals without any side effects.

References

- Anila L, Vijayalakshmi NR. Beneficial effects of flavonoids from *Sesamum indicum*, *Emblica officinalis* and *Momordica charantia*. *Phytother Res.* 2000; 14(8):592-5.
- Anila L, Vijayalakshmi NR. Antioxidant action of flavonoids from *Mangifera indica* and *Emblica officinalis* in hypercholesterolemia rats. *Food Chem.* 2003; 83:569-574.
- Antony B, Merina B, Sheeba V, Mukkadan J. Effect of standardized amla extract on atherosclerosis and dyslipidemia. *Indian J Pharm. Sci.* 2006; 68:437-441.
- Aruoma OI. Free radical, oxidative stress and antioxidants in human health and disease. *Am J Oil Chem. Soc.* 1998; 75:199-212.
- Bandyopadhyay SK, Pakrashi SC, Pakrashi A. The role of antioxidant activity of *Phyllanthus emblica* fruits on prevention from indomethacin induced gastric ulcer. *J Ethnopharma.* 2000; 70:171-176.
- Barthakar, NN and Arnold, NP 1991. Chemical analysis of the Emblic (*Phyllanthus emblica* L.) and its potential as a food source. *Scientia Hort.* 1991; 47:99-105.
- Bhandari PR, Kamdod MA. *Emblica officinalis* (Amla): A review of potential therapeutic applications. *Int J Green Pharm.* 2012; 6:257-69.
- Bhattacharya SK, Bhattacharya A, Sairam K, Ghosal S. Effect of bioactive tannoid principles of *Emblica officinalis* on ischemia-reperfusion induced oxidative stress in rat heart. *Phytomedicine.* 2002; 9(2):171-4.
- Brun V, Schumacher T. Traditional herbal medicine in northern Thailand. University of California Press 1987, pp. 349, Berkeley.
- Gaire BP, Subedi L. Phytochemistry, pharmacology and medicinal properties of *Phyllanthus emblica* Linn. *Chinese J of Integrative Med,* 2014, 1-8.
- Ganguly DK. Tea consumption on oxidative damage and cancer. *Indian Coun. Med. Res. Bull.* 2003; 33:37-51.
- Goyal RK, Kingsly ARP, Kumar P, Walia H. Physical and mechanical properties of Aonla fruits. *J of Food Engr.* 2007; 82:595-599.
- Gulati RK, Agarwal S, Agrawal SS. Hepatoprotective studies on *Phyllanthus emblica* Linn. and quercetin. *Indian J Exp. Biol.* 1995; 33:261-268.
- Hazra B, Sarkar R, Biswas S, Mandal N. Comparative study of the antioxidant and reactive oxygen species scavenging properties in the extracts of the fruits of *Terminalia chebula*, *Terminalia bellerica* and *Emblica officinalis*. *BMC Complementary and Alternative Medicine* 2010; 10:20.
- Hasan MR, Islam MN and Islam MR. Photochemistry, pharmacological activities and traditional uses of *Emblica officinalis*: a review. *Int. Curr. Pharmaceutical J.* 2016; 5(2):14-21.
- Javale P, Sabnis S. Antimicrobial properties and phytochemical analysis of *Emblica officinalis*. *Asian J Exp Biol Sci Spec.* 2010; 1:96-100.
- Khan KH. Roles of *Emblica officinalis* in medicine - a review. *Botany Res Int.* 2009; 2(4):218-228.
- Kumar A, Singh A, Dora J. Essential perspectives for *Emblica officinalis*. *Int. J of Pharma. And Chemical Sci.* 2012; 1(1):11-18.
- Kavita MB, Mallika KJ. Amlaki (Indian gooseberry): An ancient food supplement. *Int. J. Res. Ayur. Pharm.* 2013; 4(1):11-14.
- Mehrotra S, Jamwal R, Shyam R, Meena DK, Mishra K, Patra R, *et al.* Srivastava AK, Nandi SP. Anti-Helicobacter pylori and antioxidant properties of *Emblica officinalis* pulp extract: A potential source for therapeutic use against gastric ulcer. *J Med. Plant,* 2011, 5(12):2577-2583.
- Pandey G. Some important anti -cancer herbs: A review. *Int. Res. J of Pharmacy* 2011; 2(7):45-52.

22. Pareek S. Aonla (*Emblica officinalis*); Post harvest biology and technology of tropical and subtropical fruits. Extrusion system International USA Abstract, 2011.
23. Perianayagam JB, Sharma SK, Joseph A and Christina AJ. Evaluation of anti-pyretic and analgesic activity of *Emblica officinalis* Gaertn. J Ethnopharmacol. 2004; 95:83-5.
24. Rai N, Tiwari L, Sharma RK, Verma AK. Pharmacobotanical profile on *Emblica officinalis* Gaertn. – A pharmacopoeial herbal drug. STM Journals. 2012; 1(1):29-41.
25. Sairam K, Rao CV, Babu MD, Kumar KV, Agrawal VK, Goel RK. Antiulcerogenic effect of methanolic extract of *Emblica officinalis*: an experimental study. J Ethno Pharmacol. 2002; 82(1):1-9.
26. Santoshkumar J, Manjunath S, Pranavkumar MS. A study of antihyperlipidemic, hypolipidemic and anti-atherogenic activity of fruit of *Emblica officinalis* (amla) in high fat fed Albino Rats. Int. J of Medical Research and Health Sci. 2013; 2(1):70-77.
27. Sachan NK, Gangwar SS, Sharma R, Kumar Y. An investigation into phytochemical profile and nutraceutical value of Amla (*Emblica officinalis*). Int. J of Modern Pharmaceutical Res. 2013; 2(1):1-12.
28. Zhang YJ, Tanaka T, Iwamoto Y, Yang CR, Kouno I. Phyllanemblin acid, a novel highly oxygenated norbisabolane from the roots of *Phyllanthus emblica*. Tetrahedron Lett. 2000; 41:1781-1784.