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Amalaki: A review on functional and pharmacological properties

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Abstract

Amalaki (*Embolia officinalis*) (EO) has a prime position in Ayurveda- an Indian indigenous system of medicine. Amalaki belongs to the family of Euphorbiaceae and is also known as Phyllanthus emblica or Indian gooseberry. It is believed that Amalaki is the first tree to be created in the universe. Amalaki is native to India and also grows in tropical and subtropical regions of Pakistan, Uzbekistan, Sri Lanka, South East Asia, China and Malaysia. The fruits of Amalaki are widely used in the Ayurvedic preparation and it increase defense against diseases. It has a beneficial role in degenerative diseases like cancer, diabetes, liver treatment, ulcer, anaemia, eye diseases, and heart trouble and also is an important constituent in hepatoprotective and rejuvenating formulas available.

Keywords: Amalaki, *Embolia officinalis*, Rasayan, antioxidant

Introduction

Ayurveda is one of the major and main traditional medicinal systems of India. The word "Ayurveda" means "science of life". The basic concept of diagnosis and drug development in Ayurveda is based on Tridosha (three major components of disorders) theory, which includes Vayu, Pitta and Kapha. Amalaki or Indian gooseberry (*Embolia officinalis* Gaertn.) is known for its medicinal and therapeutic properties from the ancient time in India and considered as a wonder fruit for health conscious population [1]. Owing to its significant medicinal and nutritive value, it finds a prominent place in ancient Indian mythological literatures like Vedas, Shivrpan, Askandhpuran, Padmapuran, Ramayana, Kadambari, Charak Samhita, Sushrut Samhita, etc. and considered as Amrit Phal (life giving fruit). "Amalaki" is having prime position amongst the Antiageing drugs. It is the best tissue rejuvenating herb. It is a potent herb rich with Anti-oxidant, Vitamin-C, Tannin and Gallic acid. Amalaki possesses key properties like properties like Rasayana (Adaptogenic), Ajara (Anti-ageing), Ayushprada (prolonged cell life), Sandhaniya (Improves cell migration and cell binding) [2]. It promotes, protects and extends youthful state and thus, curtailing Ageing process. Amalaki fruit has a special characteristic features which makes it a nurturing herb that is credited with a number of health benefits. In Ayurvedic tradition, the fruit forms an integral part of medicinal preparations that are used to support wellness and healthy Ageing [3]. Charaka Samhita mentioned Amalaki is one of the most potent and nutritious drug and also a best rejuvenating herb (Amalaki Vayasthapnanam Sreshtham) [4]. Amalaki has low molecular weight hydrolysable Tanins (Emblcanin A and B) thereby it is considered as one of the more strong antioxidant herb in Ayurveda [5]. Free radicals are natural byproducts of our own metabolism. Apart from supplementing nutrition Amalaki gets rid of these free radicals which enhance cell ageing due to high amount of vitamin-C and flavonoids in it. Natural phenolics play a key role in antioxidative defence mechanism in biological system.

The fruiting season of amalaki

The fruiting season of Amalaki fruit is lengthy one. Amalaki is a deciduous tree and the new shoots emerges in the beginning of April [6]. The fruit can be harvested in December which can be retained on the tree up to March without any significant loss in quality or yield. The picking of fruit is generally in January to March. Amalaki tree is a heavy bearer and the fruits also remain free from the attacks of birds and wild animals.

Morphology [7]

Amalaki tree is a small to medium sized deciduous tree with an average height of 8-18 m, with thin light grey bark exfoliating in small thin irregular flakes. The average girth of the main stem is 70 cm. The main trunk is divided into 2 to 7 scaffolds very near to the base. Leaves are 10 -13 mm long, 3 mm wide, closely set in pinnate faishon which makes the branches

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feathery in appearance. Flowers are unisexual, 4 to 5 mm in length, pale green in color, borne in leaf axils in clusters of 6 to 10. Fruits are fleshy, almost depressed to globose shape, 2.1-2.4 cm in diameter, 5.3-5.7 g in weight, 4.5-5.0 mL in volume. It is commercially cultivated in Uttar Pradesh in India. It is also grown in Tamil Nadu, Rajasthan and Madhya Pradesh.

Amalaki Fruit

The fruit is fleshy, spherical, light greenish yellow, quite smooth and hard on appearance, with 6 vertical stripes or furrows 4 each containing usually two seeds; seeds are 4-5 mm long and 2-3 mm wide, each weighing 572 to 590 mg. Amalaki fruit size, shape and weight were found to vary among its different varieties. There are compositional differences in different varieties of Amalaki. In general the average composition of Amalaki fruits are: moisture 81.2%, protein 0.5%, fat 0.1%, carbohydrates 14.1%, mineral matter 0.7%, fiber 3.4%, Ca 0.05%, K 0.02%, Fe 1.2 mg/100g, nicotinic acid 0.2 mg/g, phyllembelin, phyllemblic acid, gallic acid, emblicol, quercetin, hydroxymethyl furfural, ellagic acid, pectin, putranjivan A, two new hydrolysable tannins called emblicannin A and B, punigluconin and pendunculagin [8].

Seeds

Amalaki seed contains fixed oil, phosphatides and a small



Fig 1: Amalaki fruit and leaves

quantity of essential oil in varying amount. The fixed oil yield (16%) has the following physical and chemical properties: acid value 12.7, saponification value 185, acetyl value 2.03, iodine value 139.5, unsaponifiable matter 3.81%, sterol 2.70%, saturated fatty acids 7%, linolenic acid (8.78%), linoleic acid (44.0%), oleic acid (28.40%), stearic acid (2.15%), palmitic acid (2.99%) and myristic acid (0.95%). The seed oil is rich in unsaturated fatty acids like linoleic acid (18:2n-6) and oleic acid [9].

Leaves

Amalaki leaves are Subsessile, closely set along the branchlets, distichous, narrowly linear, obtuse, having appearance of pinnate leaves. It contains Gallic acid, Ellagic acid, Chebulagic acid, Chebulinic acid, a Gallotannins called Amlic acid, Alkaloids, Phyllatidine and Phyllantine [10]. Amalaki bark contains Leucodelphinidin, Procyanidine, tannin, 3-0 gallated prodelphinidine, ellagic acid. Amalaki root contains Lupeol, Oleanolic aldehyde, ellagic acid, o-acetyl oleanolic acid. Apart from that it also contains Carotene, Nicotinic acid, Ribo flavine, D-glucose, D-Fructose, Myoinositol, etc.

Flowers

Greenish-yellow, in axillary fascicles on the leaf bearing branchlets, often on the naked portion below the leaves.

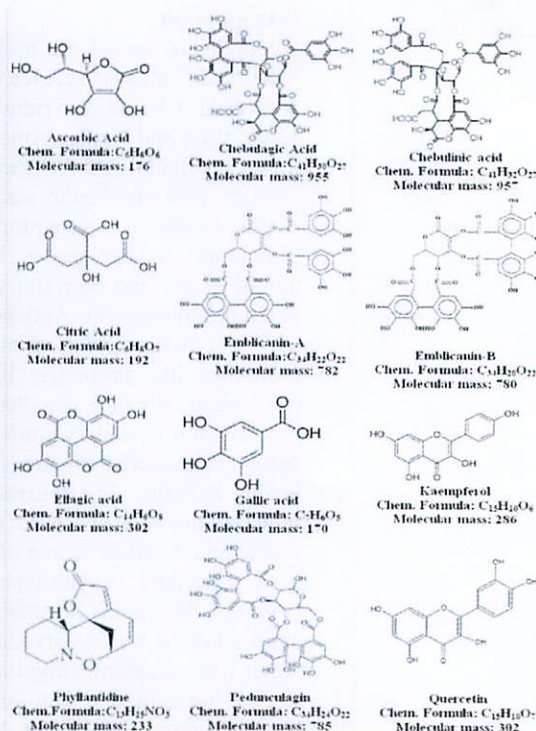


Fig 2: Active principles present in *E. officinalis*

Taxonomical Position [11]: *Emblica officinalis* Gaertn. Syn. *Phyllanthus emblica* Linn.

Kingdom: Plantae

Division: Angiospermae

Class: Eudicots

Subclass: Archichlamydeae

Series: Unisexuales

Order: Malpighiales

Family: Euphorbiaceae

Group: Emblica

Species: *officinalis* Gaertn.

Table 1: Vernacular names of *Embolica officinalis*

| S.No | | Vernacular Names |
|------|--------------|---|
| 1 | Sanskrit | Dhatrphala, Amalaki, Amaliki, Amalakan, Sriphalam, Vayastha |
| 2 | Hindi | Amalaki |
| 3 | English | Embolica myroblan, Indian gooseberry |
| 4 | Italian | Mirabolano emblico |
| 5 | German | Amalaki |
| 6 | French | Phyllanthe emblica |
| 7 | Nepalese | Amba |
| 8 | Chinese | An Mole |
| 9 | Malaysian | Popok Melaka |
| 10 | Portuguese | Mirabolano emblico |
| 11 | Ayurvedic | Amalaki, Aaamalaka, Dhaatri, Kaayasthaa, Amoghaa, Amritaphala, Amalaki, Aaamala, Dhaatriphala, Vayasyaa, Vrshya, Shiva, Hattha. |
| 12 | Unani | Aamala, Amalakij |
| 13 | Siddha/Tamil | Nellikkaai, Nelli |

Synonym- *Phyllanthus emblica* Linn.

Family- Euphorbiaceae.

Habitat- Native to tropical Southeast Asia; distributed throughout India; also planted in public parks.

Parts used- Dried fruits, Fresh fruit, seed, leaves, rootbark, flowers

Table 2: Average percentage composition of the fruit pulp of *Embolica officinalis* ^[12]

| S. No | Components | Percentage |
|-------|----------------|---------------|
| 1. | Moisture | 81.2% |
| 2. | Protein | 0.5% |
| 3. | Fat | 0.1% |
| 4. | Mineral matter | 0.7% |
| 5. | Fibre | 3.4% |
| 6. | Carbohydrate | 14.1% |
| 7. | Calcium | 0.05% |
| 8. | Phosphorous | 0.02% |
| 9. | Iron | 1.2mg/100gm |
| 10. | Nicotinic acid | 0.2mg/100gm |
| 11. | Vitamin C | 600 mg/100 gm |

Rasapanchaka (Ayurvedic pharmacodynamics) ^[13]

- **Rasa:** Amla (Sour), Kashaya (Astringent), Tikta (Bitter), Katu (Pungent), Madhur (Sweet). Sour and astringent are the predominant Rasa, but the fruit has five tastes, including sweet, bitter, and pungent
- **Guna (qualities):** Guru (Heavy), Ruksha (Dry), Sheeta (Cold)
- **Veerya (nature):** Sheeta (Cold)
- **Vipaka (taste developed through digestion):** Madhur (Sweet)
- **Doshas (effect on humors):** Tridoshashamak (Alleviate all the Three Dosha, it alleviates all three Doshas: Vata, Pitta, Kapha, and is especially effective for Pitta Dosha. Amalaki has been considered the best of the Ayurvedic rejuvenative herb and used as Rasayan.
- Due to its Amalaki Rasa (Sour) it alleviates Vata
- Due to Madhur Vipaka (Sweet) it alleviates Pitta
- Due to Kashaya Rasa (Astringent) and Ruksha (Dry) Guna it alleviates Kapha

Active roles of *Embolica officinalis*

- **Anti-ageing:** Anti-ageing: Amalaki contains low molecular weight hydrolysable Tanins (Emblicanin A and B) so it is one of the strongest antioxidant herb in Ayurveda. Embalicanin-A and -B enriched fraction from the fresh juice of the fruits. Free radicals are natural by-products of our own metabolism. Apart from

supplementing nutrition Amalaki gets obviate these free radicals that enhance cell ageing thanks to high quantity of vitamin-c and flavonoids in it. Its effect increases both frontal cortical and striatal (rat brain) concentration of free radicals scavenging enzymes (superoxide dismutase, catalase etc.) with concomitant decrease in lipid peroxidation in these brain areas ^[14].

- **Cardio protective:** The fresh juice of *E. officinalis* fruit which is rich in Embalicanin-A and -B is helpful to prevent the ischemia-reperfusion-induced oxidative stress in rat heart. The fruits are having cardioprotective effect. *Embolica officinalis* reduces oxidative stress and prevents development and progression of hypertension. It modulate levels of serum NO, activated eNOS, endogenous antioxidants, and electrolytes. Studies by Yokozawa et al. indicate that Amalaki may attenuates oxidative stress and may prevent hyperlipidemia associated with ageing ^[15].
- **Hepato protective:** Amalaki has been proved in protection against a wide variety of hepatotoxic agents, such as heavy metals ethanol, paracetamol, carbon tetrachloride, ochratoxins, hexachlorocyclohexane and antitubercular drugs. Amalaki and its contents like phytochemicals, gallic acid, ellagic acid, quercetin and corilagin, possess hepatoprotective effects against various xenobiotic compounds ^[16].
- **Against carcinogenesis:** Phenolic compounds from *Phyllanthus emblica* extract identified by HPLC having anticancer properties like Ellagic acid (tannin) in Colon, prostate cell lines, and breast and prostate xenografts, Corilagin (tannin) in Ovarian cancer cells, liver cancer cells, and hepatocarcinoma xenografts, Pyrogallol (tannin) in lung cancer cells, gastric cancer cells, and lung adenocarcinoma xenografts, Chebulagic acid (tannin) in retinoblastoma colon cancer, breast cancer, prostate cancer, and leukemia cancer cell lines, Gallic acid (tannin) in breast and lung cancer cell lines, some activity against lung cancer xenograft, Quercetin (flavonoid) in numerous cancer cell lines from multiple tissue types, transgenic murine model of breast cancer, leukemia xenograft, and phase I clinical trial ^[17].
- **Immunomodulator:** It has been demonstrated that extracts of *E. officinalis* fruit have significant immunomodulatory action. Amalaki shown immunostimulant activity and moderate cytoprotective activity. But to get the desirable pharmacological action one need to triturate Amalaki churna with Amalaki Swaras ^[18].

- **Cytoprotective:** Fruit extracts of Amalaki have cytoprotective properties against oxidative injury induced by chromium (VI). It is due to the ability to inhibit free radical production and maintain higher antioxidant levels in the cells even during oxidative stress [19].
- **Eye diseases:** Amalaki is called as Chakshyushya according to Ayurveda. It is effective in the treatment of conjunctivitis, glaucoma, diabetic eye diseases like Retinopathy, etc. It reduces intraocular pressure by virtue of its purgative action. Amalaki is beneficial in patients laid low with numerous ophthalmic disorders specifically, rubor (inflammatory conditions), mucosa xerosis (dry eye), chronic conditions (pterygium or pinguecula) and surgical cataract patients, Age connected devolution like ARMD, other retinal degenerative diseases, etc [20].
- **In gastric ulcer:** Methanolic extract of *E. officinalis*, showed dose dependant ulcer protection; it significantly reduced the offense factor (acid, pepsin) and increased the defensive factors (mucin secretion, cellular mucous) [21].
- **Intestinal disorders:** *E. officinalis* fruit contains tannins as its main component and it is astringent in nature and tannins has high potential treating intestinal disorders such as diarrhea and dysentery [22].
- **Anti-inflammatory and antipyretic:** The contents like tannins, alkaloids, phenolic compounds, amino acids and carbohydrates are proved to be having antipyretic effect. Extracts of *Embilica officinalis* fruits possess potent antipyretic and analgesic activities [23].
- **Hypolipidemic agent:** *E. officinalis* fruit juice is an effective hypolipidemic agent. It reduces aortic plaques. It is effective in low-density lipoprotein (LDL) oxidation and cholesterol levels thus preventing atherosclerotic changes [24].
- **Antidiabetic:** The high amount of vitamin C content in the fruit of Amalaki reduces the sugar level in blood. It stimulates the islets of Langerhans i.e. the isolated group of cells which secrete hormone insulin [25].
- **Antibacterial activity:** Amalaki has also possess the antimicrobial activities. The plant has been reported to possess potent antibacterial activity against *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *K. ozaenae*, *S. paratyphi A*, *S. paratyphi B* and *Serratia marcescens* [26].
- **Anti hyperthyroid:** In animal (mice) experiments ethanolic extract of fruits has been shown to possess antihyperthyroid action [27].
- **Anticancer:** Amalaki inhibits the growth and spread of different types of cancer like, stomach and malignant ascites, liver, uterus, breast, pancreas. It also reduces the side effect induced by chemotherapy and radiotherapy, which is generally used for the treatment of cancer. Amalaki also has immune stimulator and antitumor activity [28].
- **Antioxidant:** Amalaki fruit is a rich source of vitamin C and low molecular weight hydrolysable tannins. Because of these contents Amalaki becomes a good source of antioxidant. Tannins like embelicanin-A (37%), emblicanin-b (33%), punigluconin and pedunculagin conjointly give protection against Oxygen radical induced hemolysis of rat peripheral blood erythrocytes [29].
- **Nephroprotective and Neuroprotective:** Amalaki causes reduction of iNOS and COX-2 expression levels

by inhibiting NF- κ B activation thus reduction of elevated expression level of Bax occurs which is a proapoptotic protein [30].

Home Remedies

- **Hyperglycemia-** Amalaki powder with Haridra powder consumption with bitter gourd juice daily can keep control blood sugar level.
- **Cholesterol and hyperlipidemia-** 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 Amalaki powder can be taken daily after consulting with doctor.
- **Anti-ageing-** Fresh Amalaki fruit has revitalizing effect on the body as it contains several nutrients and helps in preserving the stamina in aged people. Amalaki is an ingredient in Triphala which is a best ayurvedic formulation on almost all diseases.
- **Eye diseases-** Fresh Amalaki juice or dried Amalaki powder are a good supplement to improve near-sightedness, cataract and glaucoma. It controls intra ocular tension by its Rechak (purgative) action. By virtue of presence of antioxidant it increases eye sight.
- **Hair tonic-** Application of paste of Amalaki on hair scalp nourishes the hairs and its shine.
- **Hyperacidity-** It is a good remedy to pacify Pitta conditions. Moravala is a formulation prepared from Amalaki fruit mixed with sugar syrup is the best remedy to pacify Pitta Dosha.
- **Scurvy-** As a source of Vitamin C, serves as an effective remedy in vitamin deficit condition like scurvy. Daily intake of Amalaki juice/powder in diet overcomes this condition.

Important Formulations

Chyavanaprash, Dhatri Lauha, Dhatriyadi Ghrita, Triphala Churna, Amalaki Rasayan.

Amalaki is having a very strong astringent test hence it is not as acceptable as other fruits so processing becomes necessary. Several value added products and formulations have been reported from Amalaki. Amalaki was used to prepare ready-to-serve beverage, powder, Amalaki candy, ready to eat chutney, sauce etc. The Amalaki preserve, slices, squash, juice, Chyavanaprash and Burfi (Indian sweet) are some other major commercially available products of Amalaki.

Conclusion

Present article has been a focus on the utilization of Amalaki fruit for their functional and pharmacological properties. Amalaki is stated as a Rasayana drug in Ayurveda which is having a rejuvenating effect on body tissues. Amalaki is one of the three fruits that are the ingredient in Triphala and it is the main ingredient in the Rasayan formulation Chyavanaprash. Amalaki is having highest source of vitamin C. Amalaki improves healthy metabolism, digestion and elimination. It possesses anti-inflammatory properties, nourishes body tissue and organs. Amalaki fruit is rejuvenative and protective for the heart and respiratory system. Amalaki is a natural antioxidant which promotes healthy eyes, growth of hairs, nails, and skin. It Balances Jatharagni (digestive fire). Amalaki builds Ojas (bodily strength, vigour, energy, ability) to support a healthy immune response. Amalaki pacifies Vata, Pitta, and Kapha, though it specifically alleviates Pitta. In addition, Amalaki rejuvenates all of the tissues in the body and builds Ojas which is the

essence of immunity and youthfulness. In general, Amalaki is a powerful herb which is having medicinal properties for many systems of the body. It is known to promote energy, reproductive health, and healthy state of the body. Some of the properties like Chakshyushya property needs more elaboration in context of eye diseases. Amalaki is termed as Chakshyushya (beneficial for eyes) by many ancient Acharyas. So this Chakshyushya property needs to be proven on the basis of scientific and statistical validation.

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