

**THERAPEUTIC AND MEDICINAL USES OF AMALAKI: A REVIEW****Akhil Jain<sup>1</sup> and Nidhi Garg<sup>2</sup>\***<sup>1</sup>Associate Professor Dept. of Shalakyta Tantra,<sup>2</sup>Assistant Professor Dept. of Agad Tantra, Ch. Devi Lal Ayurvedic Medical College  
Jagadhari, Ch. Devi Lal Ayurvedic Medical College Jagadhari.Article Received on  
15 Dec. 2016,Revised on 06 Jan. 2017,  
Accepted on 27 Jan. 2017

DOI: 10.20959/wjpr20172-7832

**\*Corresponding Author****Nidhi Garg**Assistant Professor Dept. of  
Agad Tantra, Ch. Devi Lal  
Ayurvedic Medical College  
Jagadhari, Ch. Devi Lal  
Ayurvedic Medical College  
Jagadhari.**ABSTRACT**

Amalaki fruit is one of the richest natural sources of vitamin C, containing approximately 20 times the vitamin C content of an orange. Its antioxidant effects explain its traditional use as one of the best rejuvenative tonics (rasayana) in Ayurvedic medicine particularly for Pitta Dosha. The main constituents of Amalaki include ascorbic acid, fatty acids, bioflavonoids, polyphenols, cytokinins, B vitamins, calcium, potassium, iron, tannins, and pectin. Its list of actions is really quite impressive. Not only is it a rejuvenative and antioxidant, but it is also hepato protective, lowers cholesterol, an excellent anti-inflammatory, laxative, diuretic, and hypoglycaemic remedy. From an Ayurvedic perspective the healing properties of Amalaki extend to all tissues (dhatus) and it has the ability to increase Ojas, meaning that it

enhances energy, immunity, fertility and joie de vivre. It helps to balance all three doshas particularly Pitta and Vata. Amalaki is in fact an excellent herb for the immune system. It has been shown to slow development and growth of cancer cells<sup>[1]</sup> probably through its ability to enhance natural cell mediated cytotoxicity<sup>[2,3]</sup> It has antimicrobial properties and is used as an antiviral for colds and flu. Constituents of Amalaki have been found to be active against a range of organisms including Staph. aureus, E. coli, C. albicans, Mycobacterium tuberculosis and Staph. Typhosa.<sup>[4]</sup> With its cooling effects, Amalaki is used for a variety of inflammatory conditions of the GI tract, ulcers, acidity, nausea, vomiting, gastritis, colitis, hepatitis and haemorrhoids. The leaf infusion with fenugreek seeds is given in India for chronic diarrhoea and acute bacillary dysentery is treated there with a syrup of Amalaki and lemon juice. As an ingredient of Triphala, Amalaki is used as a bowel tonic to clear toxins from the bowel, for

chronic constipation and IBS. Its antioxidant properties help protect the liver. Amalaki has been used traditionally for diabetes as it has a reputed hypoglycaemic effect.

**KEYWORDS:** Amalaki, *Phyllanthus embellica*, *Embellica officinalis*.

## INTRODUCTION

The *Amalaki* plant is its Sanskrit name. It has others. It is called *Indian Gooseberry* in English, *Amla* in Hindi and *Embllica Officinalis Gaertn*, *Phyllanthus Emblica* or *Terminalia Emblica* in Latin. tablets. Amalaki is revered in several traditional Vedic festivals. In the texts of the *Puranas*, it is referred to as *Divaushadhi*, which means it is a divine plant, or divine ayurvedic medicine. It contains five of the six ayurvedic tastes: sweet, sour, bitter, astringent and pungent. The only taste missing is salty. This mix of flavors gives it a holistic, balancing effect on the Doshas It is tridoshic, which means that it is pacifying to all three Doshas In traditional Indian medicine, dried and fresh fruits of the plant are used. All parts of the plant are used in various Ayurvedic Unani medicine (*Jawarish amla*) herbal preparations, including the fruit, seed, leaves, root, bark and flowers<sup>5</sup> According to Ayurveda, amla fruit is sour (*amla*) and astringent (*kashaya*) in taste (*rasa*), with sweet (*madhura*), bitter (*tikta*) and pungent (*katu*) secondary tastes (*anurasas*– Its qualities (*gunas*) are light (*laghu*) and dry (*ruksha*), the postdigestive effect (*vipaka*) is sweet (*madhura*) and its energy (*virya*) is cooling (*shita*)<sup>[5]</sup> The study showed that Amalaki is possessing various pharmacological properties. According to *Ayurveda* it is *Tridoshghna*, *Rasayan*, *Vaysthapan*, *Shophaghna*, *Raktpittaghna*, *Pramehghna*, *Arshghna*, *Vrushya*, *Chakshushya*, *Hrudya*, *Stridoshjeet*, *Jwarghn*, Immunomodulatory. According to modern it Anticancer, Antiinflammatory, Antimicrobial, Immunomodulatory, Antioxidant, Hepatoprotective, Gastroprotective, and effective medicine for many other diseases like Cataract, Osteoarthritis. Antimicrobial, Immunomodulatory, Antioxidant, Hepatoprotective, Gastroprotective, and effective medicine for many other diseases like Cataract, Osteoarthritis.

## VERNACULAR NAMES

Names for this plant in various languages include:

*lozü* in Ao languages

*halilaj* or *ihlilaj* in Arabic

*amlakhi* in Assamese

*balakka* in Batak language, an Indonesian language

*amloki* in Bengali

*amlai* in Bodo language  
*anmole* in Chinese  
*ambare* in Garo language  
*āmla* in Gujarati  
*ānvalā* in Hindi  
*kantout Prei* in Khmer  
*bettada nellikaayi* in Kannada  
*sohmylleng* in Khasi  
*āvāḷo* in Konkani  
*mak kham bom* in Lao  
*melaka* in Malay, A state in Malaysia, Malacca was named after this tree.  
*nelli* in Malayalam *heikru* in Meitei  
*āvaḷā* (or *awla*) in Marathi  
*sunhlu* in Mizo  
*zee phyu thee* in Myanmar  
*amalā* in Nepali  
*anlaa* in Oriya  
*suaklu* in Paite  
*aula* in Punjabi  
*amalika* in Sanskrit  
*dhatric* in Sanskrit, Maithili  
*nelli* in Sinhala  
*nelli* or *Nellikkāy* in Tamil  
*aavnlaa* (*amla* or *ambla* or *awla*) in Urdu  
*usiri kaay* in Telugu  
*ma kham pom* in Thai  
*skyu ru ra* in Tibetan  
*amla* in Urdu  
*me rìng, me mận, chùm ruột núi, or là mắc kham* in Vietnamese

#### SYNONYMS<sup>[6]</sup>

*Cicca emblica* (L.) Kurz  
*Diasperus emblica* (L.) Kuntze  
*Dichelactina nodicaulis* Hance

*Emblica arborea* Raf.

*Emblica officinalis* Gaertn.

*Phyllanthus glomeratus* Roxb. ex Wall. nom. inval.

*Phyllanthus mairei* H.Lév.

*Phyllanthus mimosifolius* Salisb.

*Phyllanthus taxifolius* D.Don

easons, all weather conditions, and all body types.

## **BOTANICAL DESCRIPTION**

The fruit grows on a moderate-size deciduous tree that grows in the tropical subcontinent of India. All parts of the plant are used in various ayurvedic herbal preparations, including the fruit, seed, leaves, root, bark and flowers. Amalaki is smooth on the outside. It's smallish — about a half to one inch in diameter, with many seeds. Amalaki has a very interesting property when eaten fresh. It is very sour when you bite into it, but after a few minutes it becomes sweet in the mouth. This is what is meant by the *vipaka*, or aftertaste.

## **PHARMACOLOGICAL RESEARCH**

Indian gooseberry has undergone preliminary research, demonstrating *in vitro* antiviral and antimicrobial properties.<sup>[7]</sup> There is preliminary evidence *in vitro* that its extracts induce apoptosis and modify gene expression in osteoclasts involved in rheumatoid arthritis and osteoporosis.<sup>[8]</sup> It may prove to have potential activity against some cancers.<sup>[9]</sup>

One recent animal study found treatment with *E. officinalis* reduced severity of acute pancreatitis (induced by L-arginine in rats). It also promoted the spontaneous repair and regeneration process of the rat pancreas occurring after an acute attack.<sup>[10]</sup>

Experimental preparations of leaves, bark or fruit have shown potential efficacy against laboratory models of disease, such as for inflammation, cancer, age-related renal disease, and diabetes<sup>[11,12,13]</sup>

*Emblica officinalis* tea may ameliorate diabetic neuropathy due to aldose reductase inhibition<sup>[14,15,16]</sup>

In rats it significantly reduced blood glucose, food intake, water intake and urine output in diabetic rats compared with the non- diabetic control group.<sup>[17]</sup>

Another recent study with alloxan-induced diabetic rats given an aqueous amla fruit extract has shown significant decrease of the blood glucose, as well as triglyceridemic levels and an improvement of the liver function caused by a normalization of the liver-specific enzyme alanine transaminase activity.<sup>[18]</sup>

A human pilot study demonstrated a reduction of blood cholesterol levels in both normal and hypercholesterolemic men with treatment.<sup>[19]</sup>

### CHEMICAL CONSTITUENTS

Although these fruits are reputed to contain high amounts of ascorbic acid (vitamin C), up to 445 mg per 100 g<sup>20</sup> the specific contents are disputed, and the overall antioxidant strength of amla may derive instead from its high density of ellagitannins such as emblicanin A (37%), emblicanin B (33%), punigluconin (12%) and pedunculagin (14%)<sup>21</sup> It also contains punicafolin and phyllanemblinin A, phyllanemblin other polyphenols: flavonoids, kaempferol, ellagic acid and gallic acid.<sup>[22]</sup>

### THERAPEUTIC USES

Amalaki has an affinity with the circulatory system. Studies have shown that Amalaki can produce a decrease in serum LDH<sup>[23]</sup> cholesterol levels and reduce fat deposits in the arteries, thus protecting the heart and arteries. In a clinical study, normal and hypercholesterolaemic men were given raw Amalaki fruit for 28 days and both groups demonstrated a decrease in total serum cholesterol levels.<sup>[24]</sup> Other studies have indicated that Amalaki may reduce the risk of blood clots by reducing stickiness of platelets.<sup>[25]</sup>

With its cooling properties, the fruit is commonly used in the treatment of inflammatory problems anywhere in the body. In the respiratory system, Amalaki has an antibiotic activity against a wide range of bacteria, used traditionally in treatment of lung infections.<sup>[23]</sup>

It is also used to help treat asthma. Amalaki is also a good brain tonic as it improves memory and calms disturbed Sadhaka Pitta, which can give rise to irritability, short temperedness, and depression. It is used to treat urinary tract infections with success.

When used externally, Amalaki is a popular ingredient of hair oils and soaps used to prevent hair loss and nourish the hair. It is also used as a remedy for inflammatory eye problems such as conjunctivitis. The exudation from incisions made into the fruit is used as a collyrium in

inflammatory eye conditions. The antioxidant properties of the fruit make it a potentially useful skin care ingredient against oxidative damage.<sup>[26]</sup>

Amalaki also has antifungal activities in vitro.<sup>[27]</sup>

Amalaki has been found to have chemo-toxicity preventive qualities. "*Amalaki is useful in treating abdominal tumors of the Pitta variety.*" *Charaka Samhita, Chikitsasthana 5:22.*

Excellent source of Vitamin C containing about 720 to 921 mg of Vitamin C for every hundred grams of edible material. It is the most concentrated form of Vitamin C found in the plant kingdom, and because the whole fruit is used rather than an active ingredient, it is easily assimilated by the human body. The Vitamin C in the Amalaki fruit is bonded with tannins that protect it from being destroyed by heat or light. *Charaka Samhita, Chikitsasthana 5:22.* "*Amalaki is the best among the sour fruits2.*" *Sushruta Samhita, Sutrasthana, 46:334.*

It supports healthy levels of stomach acids. Because it improves digestion but does not heat the body ideal for calming mild-to-moderate hyperacidity and other Pitta-related digestive problems.

It supports the brain and mental functioning. Amla Berry is good for the brain. It is *medhya*, meaning it nurtures and enhances coordination among *Dhi* (acquisition), *Dhriti* (retention), and *Smriti* (recall), sharpening the intellect and mental functioning. It supports the nervous system and strengthens the senses.

It Supports the heart. It is *Hridya*, which means it nurtures the heart, blood and circulation. It supports the cardiovascular system. On the other hand, it sometimes acts as a cardiac stimulant. Supports the lungs.. Amla Berry is a wonderful tonic for strengthening and nourishing the lungs (which are a major seat of Kapha dosha in the body), and the entire respiratory tract. It also pacifies *Shleshaka Kapha*, which among other things governs moisture balance in the lungs.

It Supports balanced elimination. also pacifies *Apana Vata*, thus helping with the downward flow of energy in the body. This keeps the function of elimination regular and eases constipation.

It supports fertility. By balancing Apana Vata and by nurturing all the *Dhatus* (body tissues), Amla Berry also keeps menstruation regular and healthy. Amla Berry supports the reproductive systems of both men and women and can help overcome difficulty in conceiving. It is a *vrishya* herb, which means that it enhances all the seven tissues (Dhatus), including the reproductive tissue. This herb nurtures the ovaries and sperm, and it has a property called *garbhasthapana*, which means it enhances fertility and the possibility of conception. It is especially nurturing for women, strengthening the uterus and supporting reproductive health.

It supports the urinary system. Because it enhances all the thirteen agnis (digestive fires) and supports Apana Vata, Amla Berry is especially supportive to the urinary system and can be helpful if you experience a mild burning sensation while urinating. It supports natural diuretic action, but does not force water from the body like diuretic pills. In other words, it helps eliminate waste from the body but does not overstimulate the urinary system.

It supports the skin. Because Amla Berry strengthens digestion, helps the liver detoxify and is rich in Vitamin C and minerals, it is very good for the complexion. Amla Berry moisturizes the skin, cleanses the tissues of toxins, and supports immunity of the skin against bacterial infection. It helps enhance glow and luster.

It Supports healthier hair. Amla Berry boosts absorption of calcium, thus creating healthier bones, teeth, nails and hair. It also helps maintain youthful hair color and retards premature graying, and supports the strength of the hair follicles, so there is less thinning with age.

It Acts as a body coolant. Although Amla Berry is good for all doshas and seasons, it is especially effective in the hot season to cool Pitta dosha. It is an especially good rasayana for people with Pitta and Vata body types.

It Supports vitality. Because it has five tastes and supports all the doshas and many body functions and cleanses the blood and the microchannels of the body, Amla Berry increases energy and removes fatigue. It supports regeneration of cells — the process by which tired, old cells are replaced by vital, new ones.

It Supports the eyes. Amla Berry is called *Chakshushya*, which means "strengthening the eyes" (*Chakshu* means "eye" and *Ayushya* means *rasayana*, so it is literally a "rasayana for the eyes"). It supports the health of the eye by enhancing both *Ranjaka Pitta* (the subdosha of

Pitta that governs liver function and the blood plasma) and *Alochaka Pitta* (the subdosha of Pitta that governs the eyes and vision). The tridoshic nature of *Amalaki* also

It Supports muscle tone. Amla Berry enhances protein synthesis, which is why it is good for strengthening muscles and building lean muscle mass. Its unique ayurvedic action offers athletes and bodybuilders a natural way to tone muscles and build lean mass.

### **Amla for Detoxification and Healthy Elimination**

Amla very directly promotes detoxification with its rich antioxidant content.<sup>[28]</sup> On a systemic level, detoxification begins with healthy *agni* (digestive fire), not only in the GI tract, but also in all of the tissues, and amla helps to balance *agni* throughout the body.<sup>[28]</sup> Moreover, the elimination of toxins relies on healthy circulation, digestion, and elimination, and amla supports all three of these functions.<sup>[28]</sup> Amla also has a particular affinity for the blood, the liver, and the spleen, and is therefore able to support the elimination of natural toxins while nourishing and protecting the body's natural defense systems.<sup>[28]</sup> Proper elimination is critically important to the detoxification process and amla fosters bowel health and regularity as well.<sup>[28]</sup> A small dose of amla is binding and astringent in its effect while a larger dose very gently encourages elimination. Ultimately, amla supports virtually every stage of the detoxification process—from the innate intelligence of *agni* to the proper elimination of wastes and natural toxins. It Flushes out toxins. Individuals who have been eating "junk" food for a while tend to have accumulated deposits of preservatives and additives in the liver. Amla Berry helps support the liver in flushing out chemicals and additives from the physiology. It supports the liver. It helps purify the *Rasa Dhatu* (nutrient fluid) and *Rakta Dhatu* (blood), supporting the functions of the liver. It also stimulates the liver, helping it in eliminating toxins from the body. Amla also helps maintain cholesterol health.

### **Amla for Digestion**

From an Ayurvedic perspective, digestion begins with the experience of taste and amla contains five of the six tastes, lacking only the salty taste. Further, amla sharpens the sense of taste itself<sup>[28]</sup> and so it is both stimulating and tonifying to the first stage of digestion. Amla also improves appetite and kindles *agni* (the digestive fire), which are both at the core of healthy digestion. Despite the fact that its predominant taste is sour, amla stokes the digestive fire without aggravating pitta.<sup>[1]</sup> And, amla cleanses and protects the liver, which plays a critical role in transforming food into physiologically useful nourishment.<sup>[1]</sup> Because pitta and *agni* are so intimately connected, the health of the digestive fire suffers when pitta is



aggravated. Amla is particularly suited to clearing excess pitta from the digestive tract; its bitter taste and cooling energy help to flush excess heat out through the bowel.<sup>[28]</sup> Amla can be especially supportive to digestion during the summer months when heat tends to accumulate in the body, particularly for those with pitta-predominant constitutions.<sup>[28]</sup> It supports food absorption. It enhances all thirteen digestive fires (agnis). But it works more slowly and gently than ginger or other digestion-enhancing herbs, so it can be taken by people with a lot of Pitta without fear of creating excess stomach acid. In addition, it improves assimilation of iron for healthy blood.

### **Amla for Healthy Blood Sugar Levels**

Amla's ability to stimulate microcirculation and to build ojas are thought to help promote healthy blood sugar levels, particularly in conjunction with pitta imbalances.<sup>[1]</sup> Amla also has an affinity for the urinary tract and balanced excretion of urine and balanced blood sugar levels go hand in hand.<sup>[29]</sup> On a large scale, Amla's support of the entire digestive process supports the body's ability to process food in a wholesome and efficient manner.

### **Amla for Rejuvenation**

Amla is a highly revered *rasayana* (rejuvenative) for the entire system. Specifically, it promotes youthfulness, bolsters immunity, tonifies all the body's tissues and promotes overall health and well-being.<sup>1</sup> It is a brain tonic, it promotes memory, and its sattvic nature fosters subtle awareness, balanced emotions, and clarity of mind.<sup>28,29</sup> Rasayanas are the cream of ayurvedic herbal substances, and have remark on longevity-enhancing and rejuvenative qualities. One of the most important ayurvedic texts, the Charaka Samhita, defines a rasayana as "*that which promotes strength and immunity against diseases.*" There are two types of rasayanas: those that are preventive and promote longevity, memory and intelligence; and those that are curative and treat disease. The Charaka Samhita says, "Rasayana therapy has for its object the prolongation of human life, and the refreshment and invigoration of the memory and the vital organs. It deals with formulas that enable one to retain youthful vigor up to a good old age, and which generally serve to make the human nervous system invulnerable to disease and decay. Rasayanas also create *ojas* in the body." Rasayanas enhance ojas in the body. Ojas is the most refined product of digestion and metabolism. Ojas is equated with immunity and strength. The more ojas your digestion produces, the greater your immunity to disease. Ojas supports bliss, intelligence and higher states of consciousness. The Sushruta Samhita says, "*By Bala (strength) or ojas, the muscle tissue becomes full, all movements*

*become free and perfectly coordinated, voice and complexion become clear, and externally and internally the activity of the organs of action and the sense organs becomes intelligent and evolutionary.*" Rasayanas convert easily into ojas, and thus infuse qualities of ojas into the body. The skin becomes lustrous, the eyes sparkling, the temperament stable and blissful, the mind intelligent and calm, and the body free of disease. Ojas also supports the experience of more evolved, expanded states of consciousness. Rasayanas such as Amalaki have other actions. The ayurvedic texts mention that they promote longevity, memory, intelligence, youthfulness, stable progeny, strength and immunity of the body, strength of the sense organs, the quality of purity (*sattva*), a clear voice and sweet and successful speech, respectability (due to a pure nature, good health, and prosperity), and invincibility. *Charaka Samhita* states: "*Of all the rasayanas, Amalaki is revered as one of the most potent and nourishing; Amalaki is the best among rejuvenative herbs.*" *Amalaki is useful in relieving cough and skin diseases*1." *Charaka Samhita, Sutrasthana 4:11-13, 16.*

Amalaki is in fact an excellent herb for the immune system. It has been shown to slow development and growth of cancer cells<sup>[30]</sup> probably through its ability to enhance natural cell mediated cytotoxicity.<sup>[31,32]</sup> It has antimicrobial properties and is used as an antiviral for colds and flu. Constituents of Amalaki have been found to be active against a range of organisms including *Staph. aureus*, *E. coli*, *C. albicans*, *Mycobacterium tuberculosis* and *Staph. Typhosa*.<sup>[33]</sup> It Acts as an antioxidant effective broad-spectrum antioxidants and free radical scavengers, helping to reduce disease and slow the aging process. It supports immunity. All of the benefits already mentioned make Amla Berry a strong immunity booster.

## DISCUSSION

According to Ayurveda, amla balances all three doshas. While amla is unusual in that it contains five out of the six tastes recognized by Ayurveda, it is most important to recognize the effects of the "virya", or potency, and "vipaka", or post-digestive effect. Considered in this light, amla is particularly helpful in reducing *pitta* because of its cooling energy.<sup>34</sup> It also balances both *Pitta* and *vata* by virtue of its sweet taste. The *kapha* is balanced primarily due to its drying action. It may be used as a *rasayana* (rejuvenative) to promote longevity, and traditionally to enhance digestion (*dipanapachana*), treat constipation (*anuloma*), reduce fever (*jvaraghna*), purify the blood (*raktaprasadana*), reduce cough (*kasahara*), alleviate asthma (*svasahara*), strengthen the heart (*hrdaya*), benefit the eyes (*chakshushya*), stimulate hair growth (*romasanjana*), enliven the body (*jivaniya*), and enhance intellect (*medhya*)<sup>34,35</sup>

## CONCLUSION

The literary study of fruit *Amalaki* from Ayurvedic texts and modern researches concludes that fruit i.e. *Embelica officinalis* has following properties according to Ayurveda, Rasayana, *Vrushya*, *Chakshushya*, *Panduhar*, *Krimihar*, *Udarhar*, *Vaysthapana*, *Pramehhar*, *Kamalahar*, and according to modern Antioxidant, Anti-inflammatory, Antimicrobial, Analgesic, Anticancer, Hepatoprotective, Gastroprotective, Anticarcinogenic

## REFERENCES

1. Lambertini E, Piva R, Khan MT, Lampronti I, Bianchi N, Borgatti M, Gambari R. Effects of extracts from Bangladeshi medicinal plants on in vitro proliferation of human breast cancer cell lines and expression of estrogen receptor alpha gene. *Int J Oncol*, Feb 2004; 24(2): 419-23.
2. Williamson E. Major herbs of Ayurveda. Churchill Livingstone, London, 2002.
3. Sai Ram M, Neetu D, Deepti P, Vandana M, Ilavazhagan G, Kumar D, Selvamurthy W. Cytoprotective Activity of Amla (*Emblca officinalis*) against chromium (VI) induced oxidative injury in murine macrophages. *Phytother Res.*, Apr 2003; 17(4): 430-3.
4. Khanna P, Nag TH. Isolation, identification and screening of phylllembliss from *Emblca officinalis* Gaertn. *Tissue culture. Indian Journal of Pharmacy*, 1973; 35(1): 23.
5. National R&D Facility for Rasayana - *Amalaki* pg254.
6. "The Plant List: A Working List of All Plant Species". Retrieved 14 July 2014.
7. S, Tariq P. "Antibacterial activities of *Emblca officinalis* and *Coriandrum sativum* against Gram negative urinary pathogens". *Pak J Pharm Sci.*, Jan 2007; 20(1): 32-5.
8. Penolazzi, L.; Lampronti, I.; Borgatti, M.; Khan, M.; Zennaro, M.; Piva, R.; Gambari, R. "Induction of apoptosis of human primary osteoclasts treated with extracts from the medicinal plant *Emblca officinalis*". *BMC Complementary and Alternative Medicine*, 2008; 8: 59. doi:10.1186/1472-6882-8-59.
9. Ngamkitidechakul, C.; Jaijoy, K.; Hansakul, P.; Soonthornchareonnon, N.; Sireeratawong, S. "Antitumour effects of *phyllanthus emblica* L.: Induction of cancer cell apoptosis and Inhibition of in vivo tumour promotion and in vitro invasion of human cancer cells". *Phytotherapy Research*, 2010; 24(9): 1405-1413. doi:10.1002/ptr.3127.
10. Sidhu, S.; Pandhi, P.; Malhotra, S.; Vaiphei, K.; Khanduja, K. L. "Beneficial Effects of *Emblca officinalis* in Arginine-Induced Acute Pancreatitis in Rats". *Journal of Medicinal Food*. 2011; 14(1-2): 147-155. doi:10.1089/jmf.2010.1108.

11. Ganju L, Karan D, Chanda S, Srivastava KK, Sawhney RC, Selvamurthy W. "Immunomodulatory effects of agents of plant origin". *Biomed Pharmacother*, Sep 2003; 57(7): 296–300. doi:10.1016/S0753-3322(03)00095-7..
12. T, Kim HY, Kim HJ, et al. "Amla (*Emblca officinalis* Gaertn.) attenuates age-related renal dysfunction by oxidative stress". *J Agric Food Chem.*, Sep 2007; 55(19): 7744–52. doi:10.1021/jf072105s.
13. Rao TP, Sakaguchi N, Juneja LR, Wada E, Yokozawa T. "Amla (*Emblca officinalis* Gaertn.) extracts reduce oxidative stress in streptozotocin-induced diabetic rats". *J Med Food*, 2005; 8(3): 362–8. doi:10.1089/jmf.2005.8.362..
14. Mizisin, AP1; Calcutt, NA; DiStefano, PS; Acheson, A; Longo, FM. "Aldose reductase inhibition increases CNTF-like bioactivity and protein in sciatic nerves from galactose-fed and normal rats.". *Diabetes*, 1997; 46(4): 647–52. doi:10.2337/diab.46.4.647.
15. Suryanarayana, P; Kumar, PA; Saraswat, M; Petrash, JM; Reddy, GB. "Inhibition of aldose reductase by tannoid principles of *Emblca officinalis*: implications for the prevention of sugar cataract.". *Molecular Vision*, 2004; 10: 148–54.
16. Puppala, M; Ponder, J; Suryanarayana, P; Reddy, GB; Petrash, JM; LaBarbera, DV. "The isolation and characterization of  $\beta$ -glucogallin as a novel aldose reductase inhibitor from *Emblca officinalis*". *PLOS ONE*, 2012; 7(4): e31399. doi:10.1371/journal.pone.0031399.
17. Tiwari, V.; Kuhad, A.; Chopra, K. "Emblca officinalis Corrects Functional, Biochemical and Molecular Deficits in Experimental Diabetic Neuropathy by Targeting the Oxidative Stress Mediated Inflammatory Cascade". *Phytotherapy Research*, 2011; 25(10): 1527–1536. doi:10.1002/ptr.3440.
18. Qureshi SA, Asad W, Sultana V. "The Effect of *Phyllantus emblica* Linn on Type — II Diabetes, Triglycerides and Liver — Specific Enzyme" (PDF). *Pakistan Journal of Nutrition*, Jan 2009; 8(2): 125–128. doi:10.3923/pjn.2009.125.128.
19. Jacob A, Pandey M, Kapoor S, Saroja R. "Effect of the Indian gooseberry (amla) on serum cholesterol levels in men aged 35-55 years". *Eur J Clin Nutr*, Nov 1988; 42(11): 939–44..
20. Tarwadi K, Agte V. "Antioxidant and micronutrient potential of common fruits available in the Indian subcontinent". *Int J Food Sci Nutr*, Aug 2007; 58(5): 341–9. doi:10.1080/09637480701243905..
21. Bhattacharya, A.; Chatterjee, A.; Ghosal, S.; Bhattacharya, S. K. "Antioxidant activity of active tannoid principles of *Emblca officinalis* (amla)". *Indian journal of experimental biology*, 1999; 37(7): 676–680.

22. Habib-ur-Rehman, Yasin KA, Choudhary MA; et al. "Studies on the chemical constituents of *Phyllanthus emblica*". *Nat. Prod. Res*, Jul 2007; 21(9): 775–81. doi:10.1080/14786410601124664..
23. Chopra D & Simon D. *The Chopra Centre Herbal Handbook*. Rider, London, 2000.
24. Jacob A, Pondey M, Kapoor S, Saroja R. Effect of the Indian Gooseberry (*Amla*) on serum cholesterol levels in men aged 35-55 years. *European Journal of Clinical Nutrition*, 1988; 42(11): 939.
24. Sharma H, Feng Y, Panganamala RV. Maharishi Amrit Kalash (MAK – 5) prevents human platelet aggregation. *Chica and Terpia Cardiovasolare*, 1989; 8: 227-230.
25. Chaudhuri RK. *Emblica cascading antioxidant: a novel natural skin care ingredient*. *Skin Pharmacol Appl Skin Physiol*. 15(5): 374-80. Sep-Oct 2002.
26. Dutta BK, Rahman I, Das TK. Antifungal activity of Indian plant extracts. *Mycoses*, Dec 1998; 41(11-12): 535-6.
27. Pole, Sebastian. *Ayurvedic Medicine: The Principles of Traditional Practice*. Churchill Livingstone Elsevier, 2006. 52, 126-127, 296, 303-304, 326.
28. Gogte, Vaidya V. M. *Ayurvedic Pharmacology & Therapeutic Uses of Medicinal Plants*. Reprint. Chaukhambha Publications, 2009; 310.
29. Lambertini E, Piva R, Khan MT, Lampronti I, Bianchi N, Borgatti M, Gambari R. Effects of extracts from Bangladeshi medicinal plants on in vitro proliferation of human breast cancer cell lines and expression of estrogen receptor alpha gene. *Int J Oncol*, Feb 2004; 24(2): 419-23.
30. Williamson E. *Major herbs of Ayurveda*. Churchill Livingstone, London, 2002.
31. Sai Ram M, Neetu D, Deepti P, Vandana M, Ilavazhagan G, Kumar D, Selvamurthy W. Cytoprotective Activity of *Amla* (*Emblica officinalis*) against chromium (VI) induced oxidative injury in murine macrophages. *Phytother Res*, Apr, 2003; 17(4): 430-3.
32. Khanna P, Nag TH. Isolation, identification and screening of phyllemblics from *Emblica officinalis* Gaertn. *Tissue Culture*. *Indian Journal of Pharmacy*, 1973; 35(1): 23.
33. Caldecott T. *Amalaki*, 354.
34. National R&D Facility for Rasayana - *Amalaki*, 150.