



FUNCTIONAL AND NEUTRACEUTICAL IMPORTANCE OF AMLA: A REVIEW

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Abstract:

One of these is the *Phyllanthus emblica* L. tree, commonly referred to as amla. It is a tree that grows throughout Southeast Asia and India, and its fruits comprise bioactive substances that could be developed in tandem with the growing interest in naturally occurring substances that have biological activity. Thus, the nutritive and phytochemical properties of amla as well as its health-promoting properties are the main topics of this review. Additionally, studies reveal the idea that polyphenols important elements found in the fruit, leaves, and other parts of the amla tree. Together with significant home-based actions like boosting protection from the individual's internal antioxidant defence framework and additional possible health effects like counteracting hyperlipidemia, these ingredients—which are also relatively present in vitamin C—provide an essential antioxidant effect. and anti-diabetic mechanism, in addition to the potential for antibody actions to prevent cancer treatment or lessen inflammation and damage to a person's nervous system and digestive tract. Research on the bioactive elements of amla has already produced some positive findings that may aid in illness prevention and promotion of health.

Keywords: Ascorbic acid, Antioxidant effects, hyperlipidemia treatment, cardiovascular disease prevention, management of diabetes, promotion of health.

Introduction:

Phyllanthus emblica L widely referred to as Indian gooseberry or amla, is a transient member of the Euphorbiaceae family. Amla fruits are edible and grow in parts of India, China, Pakistan, and Southeast Asia. In traditional Indian medicine, amla is used To address anxiety, sensations of burning in the skin and anemia, eyes, the male reproductive system, and the process of reproduction. in general. It also helps with food digestion so that nutrients are absorbed by all the tissues in the body, including the liver, and has a tonic effect on the heart. *P. emblica* L. is a plant whose fruit is one of the most popular botanicals and has uses in the culinary, cosmetic, and

medical fields. Besides providing good nutrition, it also has a number of medicinal uses. Because of its high phenolic compound content, One could consider emblic fruit to be a plant. based origin of organic antioxidants and components for nutraceutical or medications. Emblic's unique flavour and aroma make it a popular choice among customers. Numerous studies on humans and animals have also shown that amla has hypoglycemic, anti-inflammatory, antihyperlipidemic, antihyperglycemic, and even antioxidative properties. This is due to the antioxidants . found in amla, which help with digestion and support cell immune systems. As a result, in light of the growing concern surrounding will include an summary of the plant's dietary components as well as the phytochemistry of amla and any potential medical effects on humans following natural human consumption, primarily through diet.

Potential health benefits:

1] Protection to the heart- heart-related action:

Hypercholesterolemia is among the primary reasons for heart problems, despite the fact that amla bioactive compounds may help manage this condition. The benefits of amla and components of it in preventing heart-related illnesses have been shown in numerous studies. One such study was carried out by Shetty and Nambiar, who looked at how amla juice affected the breakdown of lipoprotein with low density and discovered that myricetin, gallic acid, and kaempferol were the juice's primary polyphenols. According to the authors, there was a 90% decrease in the oxidation of lipoprotein with low density cholesterol and a limited the absorption of LDL oxidation in macrophages. In a different study, amla polyphenols. exposed mice's cardiovascular tissue exposed to ischemia and reperfusion showed less formation of fibrosis. examined by carried out by Madan et al. examined the effects of supplementing beetal with amla children and discovered that the supplemented group had lower blood glucose, cholesterol, and LDL levels than the non- supplemented group. In an additional study, the administration of hydroalcoholic amla extract resulted in decreased arterial mean serum sodium, blood pressure, and potassium levels in hypertensive mice induced with deoxycorticosterone acetate salt. The study's findings also demonstrated that *P. emblica* L. regulated the internal antioxidant system, serum electrolyte levels, serum nitric oxide (NO) activation, and eNOS.

2] Anti- oxidant activity:

Regarding in vitro research, there has also been a strong correlation found between polyphenol concentration and antioxidant activity, which includes the ability to scavenge radicals against DPPH (1,1-diphenyl-2-picrylhydrazyl). On the surface, this is correlated and supported by numerous reports. Additional research have additionally reported on the antioxidative effects of phytochemical compounds found in amla using nitric oxide, a free radical indicator, and 3, ethylbenzothiazoline-6; 2,2'-azino-bis. Ferric decreasing activator value method (FRAP31) is one of the other assays; L Moreover, they can scavenge chelated iron, hydroxyl, and superoxide anion free radicals when combined with amla polyphenols. Antioxidants from amla have also been connected to improvements in the antioxidant status of people. Smokers who participated In a recently

Randomized clinical study with double blind and placebo control further support the amla fruit's standing as a good natural source of antioxidants.

In this comprehensive study, the participants showcased a remarkable decline in their peroxidation level, accompanied by a notable enhancement in their antioxidant status, subsequent to the consumption of 250 mg twice daily for a duration of 60 days. Astonishingly, the levels of GSH experienced a surge, while lipid peroxidation witnessed a decline among the individuals diagnosed with metabolic syndrome who diligently ingested 250 or 500 mg capsules twice a day for a remarkable span of 12 weeks. This groundbreaking revelation emerged as a result of a meticulously conducted randomised, double-blind, placebo-controlled clinical trial. However, it is worth mentioning that the antioxidant status of healthy individuals remained

unaffected even after the consumption of four 125 mg capsules, signifying the importance of individual health conditions in such matters..

3] Anticancer activity:

Numerous studies, both clinical and nonclinical, have demonstrated that polyphenols derived from plants improve cancer protection. Specifically, polyphenols produce pro-inflammatory chemicals, inhibit oxidative stress, increase apoptosis, and guard against DNA damage through a number of different mechanisms. The HeLa cell line exhibited elevated caspase-3, -7, and -8 activity, fragmentation of DNA, and increased oversight of the Fas peptide, particularly in response to amla extracts. These findings implied that although caspase-9 was unaltered, The route of death receptors in cell death had been triggered. Furthermore, *P. emblica* L. was found to decrease the in vitro Matrigel invasion investigation revealed the invasiveness of MDA-MB-231 cells, whereas normal lung fibroblasts showed no signs of cytotoxicity. Similarly, H441 and H442 lung cancer cell in humans lines were used to study the polyphenol pyrogallol (found in *P. emblica* L.). According to this study, *P. emblica* L. activity might be linked to cell cycle inhibition during the G2/M phase. Caspases are triggered by reduced mitochondrial membrane potential caused by downregulation of Bcl-2 and overexpression of Bax. Cell death is subsequently triggered by caspases through the apoptotic death-receptor pathway. Moreover, *P. emblica* L. might also provide protection against radiation and chemotherapy. According to this, it seems that the bioactive substances in amla have a shielding effect that prevents cancer from spreading to distinct cell lines. But the proof bolstering the anticancer effects of polyphenols found in amla is weak, and further study is required to clarify the underlying mechanisms.

4] Anti-diabetic activity:

P. emblica L. contains naturally occurring substances that have been connected to anti-diabetic effects. An investigation conducted in vitro found that the primary plant compounds found in amla, like ascorbic acid and ellagic acid, can inhibit the function of important enzymes that help break down glucose, especially glucosidase and amylase.

There have also been reports on the protective effects against diabetes in animals. For instance, an extract of *P. emblica* in water. freeze-dried at a rate of Plasma glycogen and lipid levels were lowered in 1.25 g/kg in streptozotocin-induced male mice with long Evan's diabetes. In a similar vein, Patel and Goyal reported that Juice from *P. emblica* L. exhibited antidiabetic potential as it reduced the rise in blood sugar levels in animals that had been given an artificial diabetes. in blood sugar levels. In a second experiment using diabetic mice, the ellagic acid-rich *P. emblica* L. extract/kg doses of 250 and 500 mg markedly lower blood glucose and higher blood sugar levels. In a similar vein, the phytochemical separate from the leaves of *P. emblica* L. yielded a comparable outcome in the Nain et al. experiment. These authors found that when diabetic mice received daily doses of 100–400 mg/kg, their serum insulin levels increased and their serum glucose levels decreased.

5] Digestive tract protection:

There is another intriguing benefit that patients with gastroesophageal reflux disease have found when they consume amla. The 500 milligrams of amla extract per pill, taken twice daily, decreased the frequency and intensity of heartburn and regurgitation when compared to the placebo cohort. The previously described studies back the notion that eating amla phytochemicals, especially polyphenols, protects the digestive system. Moreover, it would seem reasonable to argue that modern medicine at least partially endorses traditional medicine's use of amla. The bioactive compound present in amla has the potential to mitigate modifications in the nervous system, especially the biochemical ones that are seen in those who carry the Alzheimer illness. As an illustration, mice's neurotoxicity from aluminium chloride was reduced when emblicanin A and B-rich amla fruit extract (100 mg/kg) was given for a duration of sixty days. With reduced cerebellar acetylcholinesterase

activity, the amla extract- handled group demonstrated a notable enhancement in comparison to the activation from apoptotic processes (incorporating cytosolic cyto C proteins, Bax, and apoptotic protease activating factor 1). A related experiment revealed a reduction in the hyperphosphorylation of tau and a comparable result in the language of cytochrome c, catapses-3 and -9, and the protein Bax. Relevant results from animal-based studies were also reported. Al-Rehaily and others. examined the anti-ulcer and anti-secretory properties of gastrointestinal ulcers in mice by using a range of methods, such as ligating the pylorus, giving causing hypothermia, indomethacin, and necrotizing agents (25 percent NaCl, 0.2 percent NaOH, and 80 percent ethanol). At both doses (250 and 500 mg/kg), there was a decrease in the ulcer index (intoxicated ulcer techniques involving ligation of the stomach and necrotizing agent), gastrointestinal lesions and intraluminal bleeding, and ulcer index (Method of ulceration caused by hypothermic restraint). Compared to The animals housed in the group under authority, which received indomethacin alone, only the animals receiving 500 mg/kg of treatment had a considerably reduced ulcer index. This was particularly true for the ulcer-inducing indomethacin method.

6] Anti-inflammatory activity:

This alteration of inflammation indicators was also noted. in animals exposed to arsenic in a study. The animals treated with 500 mg/kg of amla extract had TNF- α , IL-1 β , and IL-6 blood levels were considerably lower than those of the rats uncovered to arsenic. alone. One more notable effect of the L. extract of *P. emblica* on mice was the diminution of paw edoema. The organic extract resulted in the creation and discharge of mediators of inflammation and pain. It is suggested that Nonsteroidal Anti-Inflammatory Drugs more so than steroidal ones mediate this effect . In a different study using Goel et al. showed using mice that

P. emblica L. extract had analgesic effects and significantly decreased abdominal writhing at a dose of 600 mg/kg. In a study involving animal exposure to arsenic, this modification of Additionally, inflammatory markers were noted. Serum TNF- α , IL-1 β , and IL-6 levels were significantly lower in animals treated with amla extract (500 mg/kg) than in animals exposed only to arsenic. The shrinkage of paw edoema in mice was another noteworthy result of the *P. emblica* L.. extract. Inflammatory and pain mediators were produced and released in response to the natural extract. It is proposed that this effect is mediated less by steroidal medications and more by nonsteroidal anti-inflammatory drugs. Goel et al. showed that *P. emblica* L. extract, at a dose of 600 mg/kg, had analgesic effects and significantly reduced abdominal writhing in another study involving mice.

7] Neurological protection:

The bioactive compound present in amla has the potential to mitigate modifications in the nervous system, especially the biochemical ones that are encountered in Alzheimer's disease carriers. For example, when mice were given 100 mg/kg of amla fruit extract which is high emblicanin A and B, the neurotoxicity persisted for sixty days. caused by aluminium chloride was reduced. With decreased Cerebellar acetylcholinesterase activity, amla extract-treated group demonstrated a notable enhancement in comparison to the activation of the apoptotic pathways (involving cytosolic cyto C proteins, Bax, and apoptotic protease activating factor 1). A related experiment revealed a reduction in the hyperphosphorylation of tau and a comparable result in the language of cytochrome c, caspases -9 and -3, and the protein Bax. The enhancement of comprising punigluconin, pedunculagin, rutin, gallic acid, emblicanin A and B, and other nutrients) to animals suffering from chemically induced neurological impairment. Neurological functions related to amla were also found to be improved in animals in good health. In this instance, it appears that unripe amla fruits may contain neuroactive compounds because the animals that ate substances from ripe fruits at 200 mg/kg and 100 mg/kg of immature fruits showed improvements. It's also significant to remember that Dhingra et al.'s research revealed some possible mechanisms of action for antidepressants that are linked to the polyphenols in amla. These authors observed that the amla extract's antidepressant properties were partially inhibited in animals that also received Alpha 1-adrenoceptor, γ -aminobutyric acid, and selective D2 receptor antagonist.

Nutritional composition of Amla:

As for ascorbic acid (vitamin C), another component of the amla fruit. Other researchers have found values from 193 mg to 720 mg per hundred grams of apples, when a different kind is used as the standard basis for comparison with amla. But because emerging issues from modern society have continually brought about new factors, the optimal recommended daily intake is still not clear at this time. Thus many governmental health authorities in countries throughout the world draw up Recommended Dietary Allowance (the minimum amount needed for a healthy person in one day) of 40–110 mg of vitamin C daily. In addition, China and Australia have suggested a every day consumption limit of 190-220 mg. Thus, in this respect a single serving (2 – 3 fruits) of fresh amla fruit from any one of the varieties listed in Table 1 should provide enough vitamin C for daily needs. As opposed to other fruits such as lime, apple, and pomegranate as well as some kinds of grapes Juice from *P. emblica* L. may contain more than the amount of vitamin C most others. What's more, amla fruits also contain significant amounts of vitamins A (290 IU), B1 (30 mg.) and E as well as calcium and iron.

A still more significant ingredient contained Ascorbic acid in Amla fruit. (vit. C). Their values have been recorded to range between 93 and 720 mg per 100g. Difficult numbers Given the various types of amla, there are several different varieties doing their own thing in studies investigating these numbers (reference ranges shown from eight separate publications). The emergency of new factors In consideration of the special needs specific to modern society, some governmental health agencies in many countries have already formulated Recommended Dietary Allowance (the minimum amount a healthy person will require per day), while others remain unable as yet to define what may be termed optimum recommended intake. Although the standards vary among nations, they generally run between 40 What's more, both the Chinese and Australian health agencies have put forth a proper daily intake of 190mg. Thus, in practical terms as long you eat either 100 g (about two to three pieces) each of any variety listed in Table I or equivalent quantities selecting from other types available on the market. This amount will be enough to fulfill daily vitamin C needs. In comparison with regular fruits, *P. emblica* L is able to provide more Vitamin C as opposed to apple juice and some lime Also, other nutritionally significant constituents of Vitamin A is found in amla fruits. (290 IU), E and B1 (30 mg. + 0.17 grazing with each % by mass = 1g0 g) et) per kcalorie; K = potassium plus manganese disilphide calcium iron).

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