

A study of Antioxidant activity of Herbal plant (Amla):

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ABSTRACT: *Phyllanthus emblica* L. (also popularly known as amla) is a tree native to the India and Southeast Asia regions that produces fruits rich in bioactive compounds that could be explored aspart of the increasing interest in naturally occurring compounds with biological activity. Thus, this review aims to highlight the nutritional aspects, rich phytochemistry and health-promoting effects of amla. Scientific evidence indicates that polyphenols are central components in fruits and other sections of the amla tree, as well as vitamin C. The rich composition of polyphenol and vitamin C imparts an important antioxidant activity along with important *in vivo* effects that include improved antioxidant status and activity of the endogenous antioxidant defense system. Other potential health benefits are the anti-hyperlipidemia and antidiabetic activities as well as the anticancer, antiinflammatory, digestive tract and neurological protective activities. The promising results provided by the studies about amla bioactive compounds support their potential role in assisting the promotion of health and prevention of diseases.

Keywords: Polyphenols; ascorbic acid; antioxidant activity; cardiovascular protection; hyperlipidemia; diabetes; health promotion

I. INTRODUCTION:

Phyllanthus emblica L. (popular known as amla or Indian gooseberry) is an ephemeral tree belonging to the Euphorbiaceae family. Amla fruits are edible and are mainly found in regions of India, Southeast Asia, China, Iran, and Pakistan [1]. Amla has an important role in the traditional medicine of India to reduce anxiety and burning sensation in skin and eyes, improve anemic condition, favor the health of the male reproductive system and reproduction, facilitate digestion, improve liver health, and also exert a tonic effect in the cardiovascular system [2,3]. The fruit of *P. emblica* L. is one of the most popular botanicals, with a wide range of uses in the medicinal, cuisine, and

cosmetic industries. It is a great nutritional supplement with several medicinal benefits [4]. Due to the abundance of phenolic compounds, Emblic fruit could be regarded as a plant source for natural antioxidants and nutraceuticals or medicinal components. Consumers like Emblic fruit because of its unique flavor and pleasant smell. In various animal and human investigations, amla has been proven to have anti-hyperglycemic, hypoglycemic, anti-inflammatory, anti-hyperlipidemic, and Antioxidant activities [1]. Amla is rich in antioxidants such as gallic acid, ascorbic acid and Phenolic compounds and thus helps the body's immune systems and digestion. Thus, due to the increasing interest and the potential of *P. Emblica* L., this review aims to provide an overview of the nutritional composition, phytochemistry and potential health benefits associated with the consumption of phytochemicals naturally found in amla.

The raw fruits are aperient; while the dried fruits are useful in inflammation, haemorrhage, cough, diarrhoea and dysentery, and in combination with iron, used for anaemia, jaundice and dyspepsia. The flowers of *E. Officinalis* are cooling, refrigerant and aperient, while the root and bark are astringent. The fermented liquor prepared from the fruits is used in jaundice, dyspepsia and cough. Exudation from incision on the fruit is used as external application for the inflammation of eye. *E. Officinalis* seeds are used for asthma, bronchitis and biliousness. *E. Officinalis* fruit contains ellagic acid, gallic acid, quercetin, kaempferol, emblicanin, flavonoids, glycosides and proanthocyanidins. Vitamin C (ascorbic acid or ascorbate), tannins (eg, emblicanins A and B) and flavonoids present in amla have very powerful immunomodulatory, antioxidant and anticancer activities. Due to rich vitamin C, amla is successfully used in the treatment of human scurvy. Quercetin present in amla has hepatoprotective effect. Fruit has also

been reported to contain phyllemblic acid, gallic acid, lipid, emblicol, colloidal complexes, micic acid, amino acids and minerals[7].

Classification:

Kingdom: Plantae

Class: Dicotyledons

Order: Malpighiales

Family: Phyllanthaceae

Genus: Phyllanthus

Species: emblica

The studies revealed that amla is used either alone or in combination with other plants for the treatment of Many diseases such as common cold and fever. Amla is also used as a diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, alterative, antipyretic, anti-inflammatory, hair tonic and it can help in preventing peptic ulcer and dyspepsia, it also acts as a digestive agent[6]. It is reported that amla shows some important activity such as radiomodulatory, chemomodulatory, Chemopreventive effects, free radical scavenging, Antioxidant, anti-inflammatory, antimutagenic and Immunomodulatory activities which are helpful in the treatment and prevention of cancer. Amla is also can be used as an antimicrobial agent; (Godbole and Pendse, 1960); Godbole, S. H., Pendse, G. S., 1960, Indian Journal of Pharmacy; El-Desouky S K, Ryu S Y, Kim Y K. Apigenin glucoside (cytotoxic acylate from Phyllanthus emblica L). Nat Prod Res. 1990, 2008; 22:91- 5; (Rani and Khullar, 2004), anticancer (Jeena et al., 2001); (Zhang et al., 2004), and antiinflammatory Agent (Asmawi et al., 1993); (Perianayagam et al., 2004). They can improve the Metal induced clastogenic effects (Biswas et al., 1999); (Dhir et al., 1990). Amla is an anodyne, ophthalmic, carminative, Digestive, stomachic, alterant, aphrodisiac, Rejuvenate, antipyretic and tonic. It is useful in Vitiated conditions of tridosha, diabetes, cough, Asthma, bronchitis, cephalalgia, ophthalmopathy, Dyspepsia, colic, flatulence, hyperacidity, peptic Ulcer, erysipelas, skin diseases, leprosy, Haematogenesis, inflammations, anaemia, Emaciation, hepatopathy, jaundice, strangury, Diarrhoea, dysentery, haemorrhages, leucorrhoea, Menorrhagia, cardiac disorders, intermittent fevers And greyness of hair etc; Nadkarni K. M.; 1993.

Nutritional composition of Amla: Amla fruits are a relevant source of carbohydrates that account for >70 g/100 g dry weight (DW) . Fiber is another relevant component (7.2–16.5 g/100 g DW) as well

contents of protein, minerals such as (iron, calcium and phosphorous), and fat (2.0–4.5, 2.1–3.1, and 0.2–0.6 g/100 g DW, respectively). The variability in the composition of Amla fruit has been attributed to the cultivar in many studies. Another important component found in amla fruit is ascorbic acid (vitamin C). Values between 193 and 720 mg/100 g have been reported in different studies that evaluated a different variety of amla. Although the optimum recommended daily intake has not been defined yet due to the emergency of new factors from modern society, many Governmental health authorities around the globe established Recommended Dietary allowance (minimum level to meet the need for a healthy person for a day) that varies between 40 and 110 mg vitamin C/day. Moreover, the Australian and China health authorities have proposed a daily intake of 190–220 mg/day.

Antioxidant activity of Amla: *E. officinalis* inhibits the growth and spread of various cancers, including breast, uterus, pancreas, stomach and liver cancers, and malignant ascites. It reduces the side effects of chemotherapy and radiotherapy. *E. officinalis* reduced the cytotoxic effects in mice dosed with carcinogens. *E. officinalis* has been reported to possess many medicinal properties, including immune-stimulator and antitumour activities Amla fruit contains 18 compounds that inhibit the growth of human tumour cells such as gastric and uterine cancer cells. *E. officinalis* inhibits the growth and spread of various cancers, including breast, uterus, pancreas, stomach and liver cancers, and malignant ascites[8].

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Immunodulatory activity of *E. officinalis*: Immune activation is an effective as well as protective approach against emerging infectious diseases. *E. officinalis* has been reported to inhibit chromium induced free radical production, and it restored the antioxidant status back to control level. It also inhibited the apoptosis and DNA fragmentation induced by chromium. It relieved the immunosuppressive effect of chromium on lymphocyte proliferation, and even restored the IL-

2 and gamma-IFN production'. E. Officinalis and *Evolvulus alsinoides* (Shankpushpi) were assessed for immunomodulatory activity in adjuvant induced arthritic (AIA) rat model. Complete Freund's Adjuvant (CFA) was injected in right hind paw of the animals induced inflammation. Lymphocyte proliferation activity and histopathological severity of synovial hyperplasia were used to study the antiinflammatory response of both the extracts, which showed a marked human. Reduction in inflammation and oedema, and caused immunosuppression in AIA rats, indicating that these drugs may provide an alternative approach for the treatment of arthritis". The immunomodulatory activity of the combined extracts of *O. Sanctum*, *W. Somnifera* and *E. Officinalis* was noticed[9].

II. PLANT MATERIAL AND PREPARATION OF EXTRACT:

The *Phyllanthus emblica* samples were collected from the garden in Chachoengsao province, Thailand. The seeds were separated from the fruit and then they were dried in hot air oven at 45 °C for 3 days, after that it was mashed to produce the powder. The Extract seed and fruit powder were macerated with ethanol at room temperature[10]. The extracts were filtered and solvent was removed using rotary evaporator to get

the extracts and it was stored in the dark at 4°C before the activity tests(Sriwatcharakul, 2018).

Tannin, alkaloids, amino acids, carbohydrates, Vitamins, fat, proteins, flavonoids, total phenolic Constituents, cytotoxicity test and Superoxide Anion free radical scavenging assay.

Tannins also known as tannic acid and they are the Group of phenolic compounds in woody flowering Plants that are important deterrents to herbivores and Also have many industrial application. Tannins are Sequestered in vacuoles within the plant cell as Secondary metabolites, which can protect the other Cell components[11]. They are normally available in the Roots, wood, bark, leaves, and fruit of many plants.The content of tannin can be evaluated by Folin–Denis's method, in brief, 50 µl of 0.1 mg/ml extract Has to be added in 30% MeOH and make up the Volume with water to a final volume of 7.5 ml and After that it has to be mixed Folin–Denis 0.5 ml and 35% of 1 ml NaHCO₃ before the final volume is Adjusted to 10 ml and then the absorbance is Measured at 700 nm (Chattheeranant and Sabajjai;2013). The alkaloid is a class of naturally occurring Organic nitrogen-containing bases and they have Diverse and important physiological effects on Humans and other animals. Some of the well-known Alkaloids include morphine, strychnine, quinine, Ephedrine, and nicotineetc[12].

Table 1. Amla home remedies

Treatment	Significance and benefit of amla
1. Use in natural cholesterol activity	Amla can strengthens the muscles of heart and can cause a significant decrease in total cholesterol, LDL cholesterol, VLDL cholesterol and triglycerides. After consulting with doctor, a 500 mg capsule of dried Amla powder can be added inone's daily routine.
2. It can cure hypertension	Vitamin-C helps to control blood pressure. The amla powder or in the form of triphala tablets or decoction can also be used.Triphala is a combination of Amla and two other herbs and it is an excellent medication for the treatment of high blood pressure.
3. Ntural cure for anemia	As amla is rich in Vitamin-C or ascorbic acid, it is an essential ingredient which helps in the absorption of Iron.
4. Herbal cough remedy	A teaspoon of Amla juice or powder can be added to a glass of warm milk and if we drink this thrice a daywill clear an unpleasent throat.Adding some ghee to this decoction can clear cough. Amla powder can be mixed with honey and if we intake this mixture twice a day can cure chronic dry cough. Amla is helpful in the treatment of tuberculosis, asthma and bronchitis.
5. Natural eye tonic	Dried Amla capsules and fresh Amla juice are a good Supplement which can improve near-sightedness, cataract and Glaucoma. They can reduce intra ocular tension and corrects the vision.
6. Promotes hair	The dried amla fruits canbe boiledin coconut oil and then ground to form

growth	amla oil. This is a very effective conditioner and can prevent balding and greying of hair. For oily hair, we need to mix half a cup of amla juice, half a cup of lime juice and some water and then we can apply this to make an anti-grease hair wash
7. Treats spots on nails with	It is a source of Vitamin C and serves as an effective remedy in vitamin deficiency condition. On addition of amla juice/powder in diet overcomes this condition.

III. EVALUATION OF ANTIOXIDANT ACTIVITY:

The antioxidant activity can be determined by DPPH. The assignment of DPPH radical-scavenger capacity is mainly based on the reaction of samples with a stable radical of DPPH (2,2-diphenyl-1-picrylhydrazyl; Sigma Aldrich, MO, USA) and Reducing it to DPPH-H (diphenylpicrylhydrazine). It Was performed according to Sharma and Bhat (2009) with a slight modification: 450 µL of fruit Extract was added to 8.55 mL of B-solution of DPPH (10 mL of A-solution DPPH mixed with 45 mL of methanol; A solution of DPPH was prepared by dissolution of 0.024 g of DPPH in 100 mL of methanol). For 60 minutes in dark condition, the samples were incubated at room temperature. The absorbance was measured by Lambda 25 (PerkinElmer, Waltham, MA, USA) at 515 nm. Trolox (Sigma Aldrich, MO, USA) was used as a Standard and results were expressed as grams of Trolox equivalent.kg⁻¹ of dry matter (g Trolox. Kg⁻¹)[13, 14].

IV. RESULT OF ANTIOXIDANT ACTIVITY OF AMLA:

Antioxidant activity was analysed by different Methods DPPH (2,2diphenyl -1-picrylhydrazine), ACW (Water soluble antioxidant compound) and ACL (Lipid soluble antioxidant compound) to cover A wide diversity of bioactive compounds with Various mechanisms of antioxidant protection Including their synergistic or antagonistic effects in Plant matter.From the study, it was found that the antioxidant Activity of currants determined by DPPH was low Slightly higher DPPH values were obtained in Intensively coloured fruits of gooseberry, but in Green gooseberry cultivars DPPH was found less With the amounts of 2.96 g Trolox.kg⁻¹ in Rixanta And 6.17 g Trolox.kg⁻¹ in Invicta. Same DPPH values were found in red fruit in red gooseberry Karat of 9.94 g Trolox.kg⁻¹ and Black Negus of 13.09 g Trolox.kg⁻¹ and in currant cultivar NS 11 With the amount of 12.55 g Trolox.kg⁻¹. In black Currant cultivars, DPPH reached higher values from 15.53

g Trolox.kg⁻¹ in Viola to 18.20 g Trolox.kg⁻¹In Focus. These results are based on the already Published data in red and black currant cultivars From Croatia and from Belgium. The antioxidant Activity is affected by various factors, such as type Of cultivar, harvesting time Bravo et al.,2015 and Locality (Mitić et al., 2011) and the extraction Methods (Tabart et al., 2012). In addition, the way Of cultivation has been proved as a significant factor Influencing antioxidant activity as well. Black Currant grown on organic farms performed greater Antioxidant activity than the fruit from conventional Production in Poland. A significant antioxidant Activity values were found in wild red currants Ribes Magellanicum from Peru and Chile. Concerning Photochemi-luminescence method, similarly to DPPH, lower ACW and ACL values were Determined in green gooseberry cultivars 1.07 g AK.kg⁻¹ and 2.86 g Trolox.kg⁻¹ in Rixanta and 1.17 G AK.kg⁻¹ and 2.40 g Trolox.kg⁻¹ in Invicta, Respectively. In red cultivars, the values of EAA And ACL were found to be higher(3.15 g EAA.kg⁻¹And 3.03 g Trolox.kg⁻¹ in Karat and 7.29 g EAA.kg⁻¹ and 11.73 g Trolox.kg⁻¹) in Black Negus Respectively. Unlike in gooseberries, the highest AOA in currant cultivars was established by ACL Method (35.77 g Trolox.kg⁻¹ in red cultivar NS 11 And 44.83 g Trolox.kg⁻¹) in black currant Viola, Where as in other black cultivars, it ranged from 61.67 g Trolox.kg⁻¹ in Ben Gairn to 86.86 g Trolox.kg⁻¹ in Otello. The lowest ACW value of 25.83 g EAA.kg⁻¹ was determined in red cultivar NS 11 and it was almost two-fold higher in black Currant with the values from 42.10 g EAA.kg⁻¹ in Viola to 52.59 g EAA.kg⁻¹ in Ben Gairn. These Results are based on the published findings in red And black currant from Hungary (Balogh, Hegedűs, & Steafanovits-Bányai, 2010).Many raw gooseberries contain more than double The amount of antioxidant activity as grape fruit and Twice the amount as tangerines or cooked asparagus.

V. CONCLUSION:

Amla or Phyllanthus emblica is known since ancient Times for its medicinal value and is

commonly used in Ayurvedic medicine. It is also believed to be a rich Source of vitamin C and is being considered as a good Replacement for vitamin C. However, in the medical Field amla is not as popular as ascorbic acid. In this paper, Our efforts are to show that amla is a more powerful Antioxidant than ascorbic acid. Our results showed that Amla extract inhibits radiation-induced lipid peroxidation In microsomes and SOD in mitochondria. Amla Extract being water-soluble, may scavenge the free radicals Responsible for initiating LPO. However, ascorbic Acid alone does not account for all these antioxidantActivities. The ascorbic acid content estimated by titrimetry And HPLC gives 4.5% and 3.25% respectively, Whereas the total ascorbic acid equivalents estimated by Cyclic voltammetry and reactivity to ABTS. Radical Indicate a value around 9.4%. The rich phytochemistry composition of amla can be seen as a relevant source of compounds with potential health benefits. The antioxidant (from the rich polyphenol composition) is a major property with scientific evidence supporting the direct inhibition of oxidative reactions and the induction of an endogenous antioxidant defense system. Beyond antioxidant activity, seems reasonable to consider with the current level of evidence that amla components (mainly polyphenols) may have a role as supporting source of active compounds to promote health (such as improving antioxidant status in smokers and improving digestive tract protection against stressing agents) and increase the protection against the development of diseases (assisting in the regulation of serum glucose and insulin levels, for instance). Although a promising scenario can be seen for amla, it is important to promote the progression of studies to strengthen the current evidence with more studies (especially at animal and human levels). Clarifying aspects related to bioaccessibility of bioactive compounds, interaction with gut microbiota, and also exploring technologies and strategies to promote the incorporation into food products (functional foods) are relevant aspects to be explored in future studies.

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