

An Review On Therapeutic Effect Of Amla

Author's Name :1) Priti Subhash Chavanke , 2) Seema Tukaram Kandalkar
Guide Name: Mrs Kaveri Vaditake.

Name of institution : Pravara Rural Education Society's College of Pharmacy, Cincholi , Nashik.

Submitted: 20-03-2023

Accepted: 30-03-2023

ABSTRACT

One of the most significant therapeutic plants in Indian traditional systems of medicine is *Phyllanthus Emblica* Linn. or *Emblica officinalis* Gaertn., also known as Indian gooseberry or Amla (Ayurveda, Unani and Siddha). It is common knowledge that all components of amla can be used to cure a variety of illnesses. Fruit is the most significant component of all. In the Hindu system of medicine, amla fruit is frequently used as a diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, anti-pyretic, hair tonic, ulcer preventative, and for common colds and fevers, either alone or in conjunction with other plants. Major chemical components of amla that have been identified through phytochemical investigations include tannins, alkaloids, polyphenols, vitamins, and minerals. It has been discovered that ascorbic acid, gallic acid, ellagic acid, emblicanin A and B, phyllembein, and quercetin are all biologically beneficial. The analgesic, anti-tussive, anti-atherogenic, adaptogenic, cardio, gastro, nephro, and neuroprotective, chemo preventative, radio and chemo modulatory, and anti-cancer characteristics of amla are shown in research papers. Amla is also said to have powerful anti-inflammatory, anti-mutagenic, anti-inflammatory, antioxidant, and immunomodulatory properties that make it effective in preventing and treating a wide range of illnesses, including cancer, atherosclerosis, diabetes, liver, and heart conditions. In this article, we go through the nutritional benefits, biochemical components, traditional applications, therapeutic benefits, and home remedy uses of amla. Based on recent research reports, we also highlighted the processes underlying the pharmacological actions, and we attempted to summarise the findings of the research conducted over the last five years with appropriate details on the possibilities for the future from a pharmacological perspective.

Keywords: Amla, traditional uses, chemical constituents, pharmacological activities, mechanisms, therapeutic application.

I. INTRODUCTION

Mother Nature has given us amazing medicinal herbs that can help us have healthy, disease-free lives. There are many therapeutic plants available in the traditional Indian medical systems of India (such as Ayurveda, Unani, and Siddha), but the most popular one is Indian gooseberry, also known as Amla or *Phyllanthus Emblica* Linn. (Syn. *Emblica officinalis* Gaertn.) is a member of the Euphorbiaceae family and an essential therapeutic herb in the Ayurvedic and Unani medical systems. It is often used as a tonic to replenish the body's lost vitality and energy. Amla is a small to medium-sized deciduous tree that can be found in China, Malaysia, South East Asia, Pakistan, Uzbekistan, Sri Lanka, and South. Its height ranges from 8 to 18 metres, and its thin, light grey bark, simple, light green, sub-sessile leaves, closely spaced along the branchlets, and greenish yellow flowers, fruits, and seeds are all present.



Image. 1. (*Phyllanthus Emblica*)

In three crustaceous cocci with two seeds, there are furrows containing six trigonous seeds. Amla is very nutrient-dense and one of the best sources of vitamin C, minerals, and amino acids[2]. It also includes a number of chemical components, including tannins, alkaloids, and phenols[3]. Emblicanin A and B, gallic acid, and ellagic acid

are among the hydrolysable tannins that have been reported to have biological activity. Nearly all parts have therapeutic qualities, especially the fruit, which has been utilised in Ayurveda as a potent rasayana and in traditional medicine to treat diarrhoea, jaundice, inflammation, and a number of other conditions[4]. In the Indian medical system, amla fruit is frequently used as a diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, anti-pyretic, and hair tonic in addition to treating common colds and fevers; to treat ulcers and dyspepsia; as a diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, anti-pyretic, and hair tonic. The analgesic[5], antitussive[6], anti-atherogenic[7], adaptogenic[8], cardio[9]gastro[10], nephro[11], neuro[12], protective, and anti-cancer[13] characteristics of amla are shown by pharmacological study studies. Amla is also said to have antimutagenic [20], anti-inflammatory [19], free radical scavenging [18], antioxidant [19], radio [15], chemo [16], and immunomodulatory [17] properties. These qualities are effective in the treatment and prevention of many illnesses, including cancer, atherosclerosis,

diabetes, peptic ulcers, anaemia, liver diseases, heart ailments, and other conditions. By focusing on the processes underlying the actions and illuminating the therapeutic applications and clinical trials, the current work aims to comprehend the nutritional value, traditional usage, biochemical components, and significant medicinal qualities of amla. Also, it provides a summary of the past five years' worth of amla study and identifies the elements that call for additional investigation into the fruit's potential health benefits.

II. SCIENTIFIC CLASSIFICATION OF E. OFFINALIS ^[21]

Family: Phyllanthaceae.
Kingdom: Plantae
Divisions : Flowering
Order : Malpighiales
Tribe : Phyllanthus
Subtribe : Fluegginae
Genus : Phyllanthies
Species : P. Emblica

III. BIOLOGICAL SOURCE ^[22- 28]

Common Name:	Indian gooseberry
Hindi NAME:	Amla
Sanskrit Name:	Amalaki, Dhatri
Latin Name:	EmbllicaOffcicinalis
Habit and Habitat:	Plant of Amla is found everywhere in India up to the height of 5000 feet. Fruits appear from October to April. Hybrid variety of Amla has bigger fruits than the wild variety. Fresh fruits are light green and ripe fruits turn light brown in colour.
Parts used:	Fresh fruit, Dried fruit, Seeds, Leaves, Root, Bark and Flowers. Fruits are generally used fresh, dry are also used.

Table. 1. (Biological Source)

IV. CHEMICAL CONSTITUENTS

Plants known for and extensively studied include amla. The research study Fruit contains about 28% of the plant's total tannin content. This tannin is found in two hydrolyzable forms, emblicanin A and emblicanin B ^[29], both of which are antioxidants. Emblicanin A hydrolyzes to yield ellagic acid, glucose, and gallic acid, whereas

emblicanin B only produces ellagic acid and glucose. Phyllemblicin can also be found in this fruit ^[30]. The additional fractionation revealed the presence of numerous additional phytochemical components, including geraniin, corilagin, gallic acid, and furosin ^[31].

Chemical components	Percentage
Fruits: Moisture	81.2%
Protein	0.5%
Fat	0.1%

Mineral matter	0.7%
Fiber	3.4%
Carbohydrate	14.1%
Bulk elements Mg/100g	Net weight
Calcium	0.05%9
Phosphorus	0.02%
Iron	1.2 mg/100g
Vitamin C	600 mg/100g
Nicotinic acid	0.2 mg/100g

Table. 2.(Chemical Constituents)

V. MORPHOLOGICAL CHARACTERS

The tree is tiny to medium-sized and can grow to a height of 1 to 8 metres (3 to 26 metres). The leaves are simple, sessile, and closely spaced along branchlets. They are light green in colour and resemble pinnate leaves. The branchlets

are 10-20 cm (3.9-7.9 in) long, usually deciduous, and are neither glabrous nor coarsely pubescent. Yellowish-green flowers are in bloom. The fruit appears to be roughly spherical, pale greenish yellow, smooth, and firm.^[32]



Image.2. (Tree, Fruit, Flowers)

VI. THERAPEUTIC EFFECT OF EMBLICA OFFICINALIS

6.1 Natural cure

Ascorbic acid, also known as vitamin C is abundant in amla and is a necessary component for iron absorption. Amla supplements can be quite helpful for people with anaemia due to iron deficiency.^[33]

6.2 Balance stomach acid (Antacids)

Amla Berries is excellent for reducing mild to moderate hyperacidity and other pitta-related digestive issues since it enhances digestion without heating the body.^[34]

6.3 Diarrhea

It is administered medicinally to alleviate diarrhoea. It is provided by the locals as a fruit decoction mixed with sour milk in cases of dysentery. The fruit's astringency is shared by the bark. An extract that is as astringent as catechu is made by decocting the root solution and then letting it evaporate. For chronic diarrhoea, the leaves are infused with fenugreek seed.^[34]

6.4 Good for skin

Amla-Berry is excellent for the complexion because it supports digestion, aids in liver detoxification, and is loaded with vitamins and minerals, including Vitamin C. Alma-Berry

hydrates the skin, rids the body's tissues of toxins, and strengthens the skin's defences against bacterial illness. It contributes to improving shine and glow^[34]

6.5 Antioxidants

The chemistry and antioxidant qualities of EO fruit extracts were examined by Poltanovetal in their study. The total phenol, total flavonoid, and total tannin assays gave extracts favourable results.^[35] The protective antioxidant processes that nature has provided for humans include superoxide dismutase, catalase, glutathione (GSH), GSH peroxidases, reductase, and Vitamin E (tocopherols) and tocotrienols), Vitamin C, etc., together with several dietary components. According to various epidemiological research, higher consumption of substances or minerals having antioxidant properties has been linked to a reduced frequency of a variety of human morbidities or fatalities. Current research has identified a variety of possible uses for manipulating free radicals or antioxidants in the prevention or treatment of disease. Antioxidant activity is known to be present in natural compounds derived from dietary components such Indian spices and medicinal herbs^[36]

6.6 Hepatoprotective

The use of natural treatments for liver problems has a long history, starting with Ayurvedic medicine and progressing to Chinese, European, and other traditional medical systems. In addition to being isolated, these phytochemicals can also be produced into single-ingredient medications that meet the quality and requirements of contemporary medicine. Each hepatoprotective plant should have its efficacy against liver disorders caused by diverse substances evaluated as part of the pharmacological validation process.^[37]

6.7 Immunostimulant

Many plants have immunostimulatory properties^[37] It has been discovered that *E. officinalis*, a superior source of vitamin C (ascorbate), enhances the activity of natural killer (NK) cells and antibody-dependent cellular cytotoxicity. A two-fold proliferation of splenic NK cells was induced by *E. officinalis*. *E. officinalis* treatment gave tumor-bearing mice a 35% longer life expectancy^[38] Moreover, Sai Ram et al. used chromium (VI) as an immunosuppressive drug to study the anti-oxidant and immunomodulatory activities of *E. officinalis*.

Chromium causes cytotoxicity, the formation of free radicals, lipid peroxidation, decreased GPx activity, and decreased GSH levels. Significant inhibition of lipopolysaccharide- and Concanavalin-A-stimulated lymphocyte proliferation was also observed. Furthermore, concanavalin A induced interleukin 2 and gamma interferon production was reduced by chromium. Cr increased DNA fragmentation and apoptosis. *E. officinalis* greatly reduced the formation of free radicals caused by Cr and returned the antioxidant status to normal. Furthermore, Cr inhibits DNA fragmentation and apoptosis in *E. officinalis*. Surprisingly, *E. officinalis* significantly increased the production of IL-2 and gamma-IFN and reduced the immunosuppressive effects of Cr on lymphocyte proliferation.^[39]

6.8 Dermatoprotective

Over the past 20 years, clinical and laboratory investigations have determined the advantages of a variety of natural components for skincare. As a result, a number of these substances and compounds are now being produced, used, or investigated for use in dermatologic illnesses in addition to their anti-aging properties.^[38,39] Due to its strong antioxidant activities, *E. officinalis* extract is known to protect human dermal fibroblasts from oxidative stress. Thus, it is thought to be advantageous for natural skin care. According to research by Fuji et al., *E. officinalis* extract enhanced fibroblast proliferation in a concentration-dependent way. Moreover, it stimulated procollagen synthesis in a concentration- and time-dependent manner. On the other hand, fibroblasts' synthesis of matrix metalloproteinases (MMP)-1 was significantly reduced, whereas MMP-2 was unaffected. These findings suggest that *E. officinalis* extract controls collagen metabolism to be an useful mitigation, therapeutic, and aesthetic agent.^[40] Majeed et al. showed that EFE has proved its efficacy in protecting against ultraviolet B irradiation-induced ROS and collagen damage in normal human dermal fibroblasts as part of continuing study for novel natural cosmeceutical actives from plant extracts. *Embrica* extract is a substantially more effective natural alternative to ascorbic acid and shows promise as a cosmeceutical treatment for photoaging.^[41,42]

6.9 Diabetes

This herb is good at regulating diabetes because of its high Vitamin C content. For two

months, taking a spoonful of its juice along with a cup of bitter gourd juice each day will activate the pancreas and allow it to generate insulin, lowering blood sugar levels in diabetics. While taking this medication, dietary restrictions must be rigorously followed. Moreover, it will stop diabetes-related ocular complications^[43].

6.10 Aging

Indian gooseberry has rejuvenating properties since it includes a substance that is essential for delaying the effects of ageing and retaining strength as we age. It strengthens the body's defences and guards against infection. It strengthens the heart, hair, and several bodily glands^[44].

6.11 Eye disorder

The juice of Indian gooseberries combined with honey is beneficial for maintaining vision. It is helpful in the management of glaucoma and conjunctivitis. It significantly lessens intraocular tension. For this condition, juice combined with honey can be taken twice daily.^[45]

6.12 Analgesic, Antipyretic and Anti-inflammatory

Many studies have demonstrated that several chemicals originating from plants have strong anti-inflammatory properties. So, they represent potential molecules for the creation of novel medications, especially those intended for the management of chronic inflammatory conditions as rheumatoid arthritis, asthma, inflammatory bowel disease, atherosclerosis, etc^[46].

VII. EXTRACTION OF INDIAN GOOSEBERRY

7.1 Material and method

The *Emblica Officinalis* used in the present work was bought from a herbal shop (Akola, India). For examination, a UV-Visible double beam Spectrophotometer (UV-1800, Shimadzu Japan Model No. 2100), HPLC, and FTIR were employed. Standard tannic acid and all solvents, including ethanol, n-Hexane, and distilled water, were acquired from Nashik Dodal Chemical Store. The % extraction of tannic acid is provided by the following relation.^[47]

% Tannic Acid Extraction at Any Time $t = A/B100$
A is the solvent's constant-time tannic acid content.
B is the maximal tannic acid concentration achieved using the Soxhlet extraction procedure.

7.2 Production of Polyphenol from *p.emblica* using Soxhlet extraction process^[48, 49]

7.2.1 Plant collection of *phyllanthusemblica*

Phyllanthusemblica were purchased from the erode, Tamil Nadu, neighbourhood market. The amla tree's bark is gathered, cleaned, and dried. It is then fed into the pulverizer, and the resulting powder is sieved through a screen with a mesh size of 100 to produce a homogenised product with a size of 150 μ m. To get the most of the desired material in the finished product, use the powdered material. Images 3 and 4 depict, respectively, the gathering of bark and the filtering of powdered bark.



Image. 3.(Bark collection)



Image.4.(Sieving of powdered bark.)

7.2.2 Raw materials used:

Gallic acid, Folin-ciocalte reagent, and Sodium carbonate chemicals were employed for the standardisation and extraction operations, while ethanol, methanol, and acetone were used as solvents.

7.2.3 Soxhlet extraction methods :

The Soxhlet device is a commonly used technique in numerous laboratories for the extraction of oil

from various materials. The following describes the extraction and separation process step by step:

1. Amla tree bark is gathered, cleaned, and dried before being processed into powder in a pulverizer with a 100 micro screen size.
2. For polyphenol extraction, the Soxhlet technique is used. In the image, we can see the Soxhlet equipment.
3. the raw material's 50 gm of powder,
5. the pulverizer's conversion into powder. Bark is placed into the apparatus after being filtered via the filter paper.
4. The 150 ml of the chosen solvent (Ethanol, Methanol, or Acetone) is added to the water in a 7:3 ratio.
5. A minimum of three refluxes must be obtained throughout the extraction process, which takes 30 minutes.
6. To obtain extraction paste, the prepared extraction is kept in a 60 °C refrigerator.
7. The paste is dried in a low-temperature oven, producing powerful extraction.
8. The processed product's total polyphenol content is analysed.



Image.5.(Soxhlet extraction apparatus)

7.2.4 determination of total phenolic content :

Based on Folin, the total phenolic content of the product was ascertained using the Ciocalteu (FC) colorimetric method, as seen in Image 6. Using a spectrophotometer, the blue color's absorbance was determined (at 760 mmHg). The total phenolic content of gallic acid was derived from its calibration curve, and the yield (in%) was calculated using this information.



Image.6.(Total Polyphenol content)

7.3 Extraction of tannic acid from p. emblica:

7.3.1 Simple distillation

Tannic acid extraction percentage and the impact of the working parameters have to be estimated using standard extraction tests. 30 g of ground *Embllica Offcinalis* fruit powder were added to an extractor with a distillation column and 300 ml of solvent after being ground into a powder. In a flask, the solution combination is heated until it boils. When pure liquid is heated in a condenser, it turns back into liquid after evaporating and leaving the flask. The distillate is a pure liquid that is collected and stored in a flask. [50]

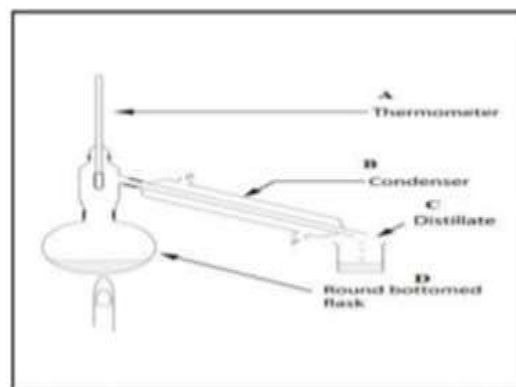


Fig .1. (Simple distillation)

7.3.2 Hot Continuous Extraction (Soxhlet)

Hot continuous extraction (Soxhlet) was used to determine the solute's most extreme recoverable component in the raw material. Fruit from *Embllica Offcinalis* (Avala) ground to a consistent size in a mixer. A thimble containing 30 g of raw material (fruit powder) and 400 cm² of distilled water was used in the soxhlet extraction procedure, which was carried out over the course of 24 hours. 672.16 mg/L distilled water was the equilibrium concentration of tannic acid at time 24 hours. [51]

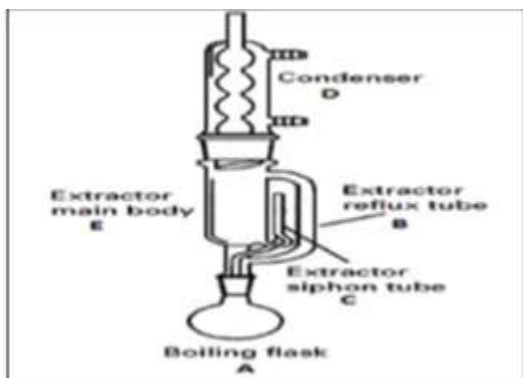


Fig.2.(Soxhlet extraction)

7.3.3 Analytical Methods

By using high performance liquid chromatography (HPLC) analysis, tannin concentration can be estimated: The method described by Seruga et al. (2011) was modified to estimate the tannic acid concentration using HPLC. Gallic acid is produced when tannin is hydrolyzed. Tannic acid standards in the range of 1-100 mg L⁻¹ were used to create calibration curves by mixing 0.1 ml of standard tannic acid with 10 ml of acetonitrile. Tannic acid was detected at a wavelength of 276 nm. Tannic acid was identified using the HPLC column parameter C18 (250 x 4.6 mm, 5µm) and run time of 6.0 min. The result was represented as TAE g⁻¹ of sample. In order to prepare the sample, 0.1 ml of the sample was extracted in 10 ml of mobile phase using various solvents, including ethanol, distilled water, and n-hexane. [52]

VIII. CONCLUSION

Today, there is a renewed interest in studying the traditional medicinal herbs of India. Although the other medical systems are efficient, they also have a multitude of negative side effects that frequently result in life-threatening complications. Herbal medication alleviates all of these issues because it is natural. *Emblica officinalis* (Amla), an indigenous medical system from India, plays a significant role in Ayurveda. Amla, which contains the highest amount of vitamin C and essential nutrients, prevents a wide range of diseases due to its powerful antioxidant and biological properties. It may be utilised in the nutraceuticals and biopharmaceutical industries as well as as a potential food additive. Many studies have shown that different amla extracts and herbal formulations may have therapeutic benefits against a variety of disorders and have effects that are comparable to those of conventional medications. .

In this review, we attempted to establish the fundamental mechanisms behind the traditional and empirically supported usage of amla. Even though amla has a variety of medical characteristics that have been known for centuries, it is imperative to use the most up-to-date biotechnological tools and procedures to scientifically examine and demonstrate amla's medicinal values at the molecular level.

REFERENCES

- [1]. Maurya U, Srivastava S, Traditional Indian herbal medicine used as antipyretic, antiulcer, anti-diabetic and anticancer: A review, *International Journal of Research in Pharmaceutical Chemistry*,1(4), 2011, 1152-9.
- [2]. Srivasuki KP, Nutritional and health care benefits of Amla, *Journal of Pharmacognosy*, 3(2), 2012, 141-51.
- [3]. Zhang LZ, Zhao WH, Guo YJ, Tu GZ, Lin S, Xin LG, Studies on chemical constituents in fruits of Tibetan medicine *Phyllanthusemblica*, *ZhongguoZhong Yao ZaZhi*, 28(10), 2003, 940-3.
- [4]. Udupa KN, Ayurveda for Promotion of Health, *Journal of Ayurveda*, 3, 1985.
- [5]. Sharma SK, James B, Perianayagam, Aney Joseph AJM, Christina, Evaluation of anti-pyretic and analgesic activity of *Emblica officinalis* Gaertn, *Journal of Ethnopharmacology*, 95, 2004, 83-5
- [6]. Nosal ova G, Mokry J, Hasan KM, Antitussive activity of the fruit extract of *Emblica officinalis* Gaertn, (*Euphorbiaceae*), *Phytomedicine*, 10, 2003, 583-9.
- [7]. Santoshkumar J, Manjunath S, Pranav Kumar MS, A study of anti-hyperlipidemia, hypolipidemic and anti-atherogenic activity of fruit of *Emblica officinalis* (amla) in high fat fed Albino Rats, *International Journal of Medical Research and Health Sciences*, 2(1), 2013, 70-77.
- [8]. Muruganandam AV, Kumar V, Bhattacharya SK, Effect of poly herbal formulation, EuMil, on chronic stress-induced homeostatic perturbations in rats, *Indian Journal of Experimental Biology*, 40(10), 2002, 1151-60.
- [9]. Baliga MS, Prabhu AN, Prabhu DA, Shivashankara AR, Abraham A, Palatty PL, Antidiabetic and

- Cardioprotective Effects of Amla (*Embliaofficinalis*Gaertn) and its Phytochemicals: Preclinical Observations, Bioactive Food as Dietary Interventions for Diabetes, 2013, 583-600.
- [10]. Chatterjee A, Chattopadhyay S, SandipK, Bandyopadhyay, Biphasic Effect of *Phyllanthusemblica* L. Extract on NSAID-Induced Ulcer: An Anti-oxidative Trail Weaved with Immunomodulatory Effect, Evidence-Based Complementary and Alternative Medicine, 2011, 2010, 1-13.
- [11]. Yokozawa T, Kim HY, Kim HJ, Tanaka T, Sugino H, Okubo T, Chu D, Juneja LR, Amla (*Embliaofficinalis*Gaertn.) Attenuates Age-Related Renal Dysfunction by Oxidative Stress, Journal of Agricultural and Food Chemistry, 55, 2007, 7744-52.
- [12]. Vasudevan M, Parle M, Memory enhancing activity of Anwalachurna (*Embliaofficinalis*Gaertn.): An Ayurvedic preparation, Physiology & Behaviour, 91(1), 2007, 46-54.
- [13]. Madhuri S, Studies on estrogen induced uterine and ovarian carcinogenesis and effect of ProImmu in rat, PhD thesis, Jabalpur, MP, RDVV, 2008.
- [14]. Krishnaveni M, Mirunalini S, Chemopreventive efficacy of *Phyllanthusemblica* L. (amla) fruit extract on 7,12-dimethylbenz(a)anthracene induced oral carcinogenesis – A dose-response study, Environmental Toxicology and Pharmacology, 34(3), 2012, 801-10
- [15]. Adil MD, Kaiser P, Satti NK, Zargar AM, Vishwakarma RA, Tasduq SA, Effect of *Embliaofficinalis* (fruit) against UVB-induced photo-aging in human skin fibroblasts, Journal of Ethnopharmacology, 132(1), 2010, 109-14.
- [16]. Deep G, Dhiman M, Rao AR, Kale RK, Chemopreventive potential of Triphala (a composite Indian drug) on benzo(a)pyrene induced fore stomach tumorigenesis in murine tumor model system, Journal of Experimental and Clinical Cancer Research, 24(4), 2005, 555-63.
- [17]. Varadacharyulu N, Damodara Reddy, Padmavathi P, Paramahansa M, Modulatory role of *Embliaofficinalis* against alcohol induced biochemical and biophysical changes in rat erythrocyte membranes, Food and Chemical Toxicology, 47, 2009, 1958-63.
- [18]. Prakash D, Upadhyay G, Gupta C, Pushpangadan P, Singh KK, Antioxidant and free radical scavenging activities of some promising wild edible fruits, International Food Research Journal, 19 (3), 2012, 1109-16.
- [19]. Nripendranath, Bibhabasu H, Rhitajit S, Santanu B, Comparative study of the antioxidant and reactive oxygen species scavenging properties in the extracts of the fruits of *Terminaliachebula*, *Terminaliabelerica* and *Embliaofficinalis*, BMC Complementary and Alternative Medicine, 10, 2010, 1-15.
- [20]. Santoshkumar J, Devarmani MS, Sajjanar M, Pranavakumar MS, Dass P, A study of Anti-inflammatory activity of fruit of *Embliaofficinalis* (Amla) in Albino rats, Medical Innovations, 2(1), 2013, 17-26.
- [21]. <https://en.m.wikipedia.org/wiki/Phyllanthaceae>
- [22]. Jain SK. Medicinal Plants. National Book Trust, New Delhi, 1968.
- [23]. Udupa KN. Ayurveda for Promotion of Health. Journal of Ayurveda 1985; 3(Jan- March).
- [24]. Thakkur, Chandrasekhar. Introduction to Ayurveda. Ancient Wis Pub, Bombay, 1965.
- [25]. Puri HS. An Ancient Preparation for Respiratory Diseases. Drug Research Journal 1970; 15-16.
- [26]. Tarasa TL. Effects of Chayavan Prash. Journal Research Ayur 1970; SID (3).
- [27]. Asmawi. Anti-inflammatory activities of *Embliaofficinalis*. Journal Pharm Pharmacol 1993; 45(6):581-584.
- [28]. Rehman H, Yasin KA, Choudhary MA, Khaliq N, Rahman A, Choudhary MI, et al. Studies on the chemical constituents of *Phyllanthusemblica*. Nat Prod Res 2007; 21:775-81.
- [29]. Rajak S, Banerjee S, Sood S, Dinda A, Gupta Y, Gupta S, et al. *Embliaofficinalis* causes myocardial adaptation and protects against oxidative stress in ischemic-reperfusion injury in rats. Phytother Res 2004; 18:54-60.
- [30]. Chatterjee A, Chattopadhyay S, Bandyopadhyay SK. Biphasic effect of

- Phyllanthusemblica L. Extract on NSAID-induced ulcer: An antioxidative trail weaved with immunomodulatory effect. *Evid Based Complement Alternat Med* 2011;2011:146808.
- [31]. Mirunalini S, Krishnaveni M. Therapeutic potential of Phyllanthusemblica (Amla): The ayurvedic wonder. *J Basic ClinPhysiolPharmacol* 2010;21:93-105.
- [32]. <https://en.wikipedia.org/wiki/Phyllanthusemblica>
- [33]. Kumar KP, Bhowmik D, Dutta A, Yadav AP, Paswan S, Srivastava S, et al. Recent trends in potential traditional Indian herbs *Emblicaoofficinalis* and its medicinal importance. *J PharmacognPhytochem* 2012;1:18-28.
- [34]. Singh E, Sharma S, Pareek A, Dwivedi J, Yadav S, Sharma S. Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (*Phyllanthusemblica*): The sustainer. *J Appl Pharm Sci* 2011;2:176-83
- [35]. Poltanov EA, Shikov AN, Dorman HJ, Pozharitskaya ON, Makarov VG, Tikhonov VP, et al. Chemical and antioxidant evaluation of Indian gooseberry (*Emblicaoofficinalis*Gaertn. syn. *Phyllanthusemblica* L.) supplements. *Phytother Res* 2009;23:1309-15.
- [36]. Bhandari PR, Kamdod MA. *Emblicaoofficinalis* (Amla): A review of potential therapeutic applications. *Int J Green Pharm* 2012;6:257-69.
- [37]. Girish C, Pradhan SC. Indian herbal medicines in the treatment of liver diseases: Problems and promises. *FundamClinPharmacol* 2012;26:180- 9.
- [38]. Fowler JF Jr, Woolery- Lloyd H, Waldorf H, Saini R. Innovations in natural ingredientand their use in skin care. *J Drugs Dermatol* 2010;9:S72- 81.
- [39]. Reuter J, Merfort I, Schempp CM. Botanicals in dermatology: An evidence- based review. *Am J ClinDermatol* 2010;11:247- 67.
- [40]. Fujii T, Wakaizumi M, Ikami T, Saito M. Amla (*Emblicaoofficinalis*Gaertn.) extract promotes procollagen production and inhibits matrix metalloproteinase- 1 in human skin fibroblasts. *J Ethnopharmacol* 2008;119:53- 7.
- [41]. Majeed M, Bhat B, Anand S, Sivakumar A, Paliwal P, Geetha KG. Inhibition of UV- induced ROS and collagen damage by *Phyllanthusemblica* extract in normal human dermal fibroblasts. *J CosmetSci* 2011;62:49- 56.
- [42]. Adil MD, Kaiser P, Satti NK, Zargar AM, Vishwakarma RA, Tasduq SA. Effect of *Emblicaoofficinalis*(fruit) against UVB- induced photo- aging in human skin fibroblasts. *J Ethnopharmacol* 2010;132:109- 14.
- [43]. Udupa KN. Ayurveda for Promotion of Health. *Journal of Ayurveda* 1985; 3(Jan- March).
- [44]. Jacob, Panday, Kapoor, Saroja. Effect of the Indian Gooseberry (Amla) on serum cholesterol levels in men aged 35- 55 years. *European Journ Clin Nutrit*1988; 42:939- 944.
- [45]. Puri HS. An Ancient Preparation for Respiratory Diseases. *Drug Research Journal* 1970; 15- 16.
- [46]. Calixto JB, Campos MM, Otuki MF, SantosAR. Anti- inflammatory compounds of plant origin. PartII. modulation of pro- inflammatory cytokines, chemokines and adhesion molecules. *Planta Med* 2004;70:93- 103.
- [47]. J.G. Gujar, S. Chattopadhyay,S.J. Wagh and V.G. Gaikar, “Experimental and Modeling Studies on Extraction of Catechin Hydrate and Epicatechin from Indian Green Tea Leaves” *The Canadian Journal of chemical engineering*, Vol.88, April 2010, pp.232-240.
- [48]. Germano MP, Angelo VD, Biasini T, Sanogo R, De Pasquale R, Catania S, “Evaluation of the antioxidant properties and bioavailability of free and bound phenolic acids,” *J Ethnopharmacol.*2006 May 24;105(3):368-73. Epub 2006 Jan 19. DOI:10.1016/j.jep.2005.11.029
- [49]. Kadam Trupti S. Mohite Shrinivas K. Magdum Chandrakant S. Adnaik Rahul S “Quantitative estimation of total phenolic content of *Pueraria tuberosa* using different extract by U V spectrophotometry,”*Journal of Pharmacy Research* 2012,5(5), pp.2493-2495
- [50]. R.Wongkittipong, L.Prat, S.Damronglerd, C.Gourdon, “Solid-liquid extraction of andrographolide from plants –experimental study, kinetic



- reaction and model”, Separation purification technology, Vol.40, 2004, pp.147-154.
- [51]. M. Sivasankar Reddya, B. Prathimaa, M. Sarasw-athib, S. Babuc, Y. Saralad, A. Varada Reddya “Sy-nthesis, spectral aspects and biological activities of 5-hydroxy 2-nitrobenzaldehydethiose-micarbazone and their Mn(II), Co(II) and Ni(II) complexes” Journal of Applied Pharmaceutical Science Vol. 6 (05), May 2016 pp. 090-096
- [52]. Sytar O, Hemmerich I, Zivcak M, Rauh C, Brestic M “Comparative Analysis of Bioactive Phenolic Compounds Composition” Saudi Journal of Biological Sciences Vol no.25(4) May 2018, pp.631-641.