

Indian Journal of Modern Research and Reviews

This Journal is a member of the 'Committee on Publication Ethics'

Online ISSN:2584-184X



Research Article

Health Promoting Effects, Anti – Inflammatory Effects, Nutritional Aspects, Antioxidant, Pharmaceutical and Antimicrobial Activities of Natural Immunomodulator *Phyllanthus Emblica* L

Dr. Neelam Jatolia

Department of Chemistry, Shree Lumba Ram Memorial College, Lohawat, Jodhpur, Rajasthan, India

Corresponding Author: * Dr. Neelam Jatolia

DOI: <https://doi.org/10.5281/zenodo.19592177>

Abstract

Phyllanthus Emblica (Euphorbiaceae Family) is a tree native to the India and Southeast Asia. The tree has thirteen synonyms listed in the world flora online database. In Ayurveda *Phyllanthus Emblica* is known to be a potent rasaynsa or rejuvenator. *Phyllanthus Emblica* is one of the most important medicinal tree in the Indian traditional system of medicine (Ayurveda, Unani and Siddha). It's well known fact that all parts of *Phyllanthus Emblica* are usefull in the treatment of various diseases but most important part is the fruit. The fruit rich in bioactive compounds that could be explored as part of the increasing interest in naturally occurring compounds with biological activity. It is numerous uses for hair and skin. It is also have antimicrobial properties that can helps with dandruff and other scalp issues. Phytochemical studies of *Phyllanthus Emblica* disclosed major chemical constituents including tannins, alkaloids, polyphenols, vitamins and minerals. *Phyllanthus Emblica* has many functions including clearing heat cooling blood, digestive food and relieving cough. *Phyllanthus Emblica* has been shown to be font of nutrients and small bioactive chemicals that provide a wide array of health benefits. It is a rich source of vitamin C there are high levels of vitamins A, B1, B2, B3, B5 and B6 as well as essential minerals such as Mg, Mn, K, P and Zn. The berry contains a number of phenolic antioxidant compounds including rutin quercetin, myricetin, ellagic acid, garlic acid and chlorogenic acid curcuminoids and complex tannins. *Phyllanthus Emblica* fruit extracts have anti-inflamantory compounds and extracts shown strong anti- inflammatory effects by blocking two key inflammation – related substances: NO and COX-2.

Manuscript Information

- ISSN No: 2584-184X
- Received: 01-03-2026
- Accepted: 30-03-2026
- Published: 15-04-2026
- MRR:4(SP1); 2026: 26-30
- ©2026, All Rights Reserved
- Plagiarism Checked: Yes
- Peer Review Process: Yes

How to Cite this Article

Jatolia N. Health Promoting Effects, Anti – Inflammatory Effects, Nutritional Aspects, Antioxidant, Pharmaceutical and Antimicrobial Activities of Natural Immunomodulator *Phyllanthus Emblica* L. Indian J Mod Res Rev. 2026;4(SP1):26-30.

Access this Article Online



www.mrrjournal.in

KEYWORDS: *Phyllanthus Emblica*, Anti-Inflammatory Activity, Antioxidant Activity, Health Promotions, Pharmaceutical Activities.

1. INTRODUCTION

Phyllanthus Emblica belongs to the family of Euphorbiaceae and is also known as Indian gooseberry. *Phyllanthus Emblica* is one of the most important medicinal plant in Indian traditional system of medicine Ayurveda, Unani and Siddha as well as in Traditional Chinese Medicine. It is a small to medium-sized tree with smooth, greenish bark that peels naturally. The trees grow in wet, forested, hilly areas on the Indian subcontinent, and the fruit ripens in the autumn. It is commonly found across India, Sri Lanka, and China, where it can grow up to 45 feet tall in hilly areas. Many people also cultivate it in gardens and yards for its useful properties [1]. In Present day antibacterial therapy for bacterial diseases is mainly focused by the use of antibiotics and numerous synthetic antibacterial drugs. The use of plant extracts and phytochemicals with known antibacterial properties may be of immense importance in therapeutic treatments [2]. It is increasingly being realized that the majority of the diseases are mainly due to imbalance between pro-oxidant and anti-oxidant homeostatic phenomenon in the body. Pro-oxidant condition dominates either due to increased generation of free radicals or their poor quenching scavenging into the body. Free radicals are fundamental to any biochemical process and represent an essential part of aerobic life and

metabolism. Equilibrium status of pro-oxidant/antioxidant reaction is disturbed during oxidative stress in living systems, which mediates damage to cell structures, including lipids, membranes, proteins and DNA. So there has been an upsurge of interest in the therapeutic potentials of medicinal plants as antioxidants in reducing such free radical induced tissue injury [3].

Chemical Components

Phyllanthus Emblica has been shown to be a font of nutrients and small bioactive chemicals that provide a wide array of health benefits. It is a rich source of vitamin C which can occur in up to 33% [4], and as reported by Rani (2017) there are high levels of vitamins A (2%), B1 (3%) and B2 (3%), B3(2%), B5 (6%) and B6 (6%), as well as essential minerals such as Mg (3%), Mn (7%), K (4%). P (4%), and Zn (1%) [4]. The berry contains a number of phenolic antioxidant compounds including rutin, quercetin, myricetin, ellagic acid, gallic acid, and chlorogenic acid, curcuminoids and complex tannins such as emblicanin, punigluconin, pedunculagin, in addition to the alkaloids Phyllantine, Phyllembein, Phyllantidine [5]. Many of these metabolites are known to contribute to healing.

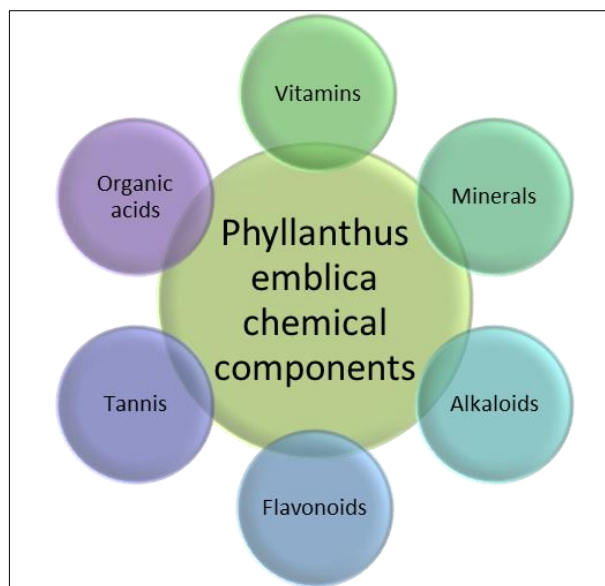


Fig 1: Main classes of chemical components in *Phyllanthus Emblica* Linn

Pharmacological activities

Pharmacological studies into the bioactivity of *Phyllanthus Emblica* fruit and plant extracts support its traditional use in the treatment of inflammation, as an immune enhancer, for antiaging and health promoting effects. Its seeds have shown promise in treating asthma and bronchitis, while its juice is used for eye care. Traditional healers have used *Phyllanthus Emblica* extracts for wound healing and treating snakebites and scorpion stings [6-8].

Immune System

Researchers are increasingly interested in plant-based bioactive compounds that can support immune health. *Phyllanthus Emblica* is such a natural immunomodulator.

Preparation of *Phyllanthus Emblica* Juice Powder

The fruits of *Phyllanthus Emblica* were purchased from local market. Fruits were washed thoroughly to remove the debris and other adhering material. The fruits were chopped into small pieces and the seeds removed. The juice of the fruit was then

extracted by using a cold pressure juice extractor and vacuum dried to obtain the powder. The powder obtained was then immediately packed in airtight container to prevent moisture attack.



2. MATERIALS AND METHODS

Chemicals Mueller Hinton Broth (Himedia M391-100G), Mueller Hinton Agar No 2 (Himedia M1084-500G), Mueller Hinton Agar 2% Glucose with methylene blue (Himedia M1825-100G), Gentamicin (Product Code: TC026), Folin Ciocalteau reagent, Sodium carbonate, Gallic acid, Phosphate buffered saline, Hydrogen peroxide, Ascorbic acid etc.

Test Organisms

Microbial strains of gram positive and gram negative bacteria namely *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas fluorescens*, *Bacillus subtilis* and fungi namely *Aspergillus niger*, *Penicillium chrysogenum*, *Alternaria alternata* and *Fusarium* spp. (table -4).

Evaluation of Antimicrobial Activity

Antibacterial and Antifungal Activity

In vitro antibacterial and antifungal activity was tested against *Phyllanthus Emblica* juice powder. Mueller Hinton Agar media was used for the culture of test organisms in case of bacteria and Mueller Hinton Agar along with 2% glucose and methylene blue in the case of fungi. About 15 to 20 ml of the respective media were poured into sterilized petri dishes and allowed to solidify. Wells of 8mm in diameter were punctured in the media using sterile cork borer. Different concentrations of sample were seeded in the wells. Plates were incubated at 33 °C for 28 hours in case of bacteria and 25 °C for 50-74 hrs in case of fungi. Antimicrobial activities were evaluated by measuring the inhibition zone diameters. Gentamicin was used as the standard antibacterial drug and Amphotericin as the standard antifungal drug [9].

Determination of Minimum Inhibitory Concentration

(MIC): *Phyllanthus Emblica* juice powder was screened for its minimum inhibitory concentration (MIC, mg/ml) against selected Gram positive organisms *viz.* *S.aureus*, *Bacillus subtilis* and Gram negative organism *viz.* *E. Coli*, *Pseudomonas fluorescens* by broth dilution methods as recommended by the National Committee for Clinical Laboratory Standards.

Gentamicin was used as the standard antibacterial agent. Solutions of test compounds and reference drug were prepared at concentrations of 150, 75, 37.05, 12.5, 18.75, 9.37.125 mg/ml. The tests were carried out in triplicate against each of the test organism. The tubes were incubated at 33 °C for 28 hours at 150 RPM. At the end of the incubation period, MIC values were recorded as the lowest concentration of the substance that gave no visible turbidity, i.e. no growth of the inoculated bacteria [10].

Determination of Minimum Bactericidal Concentration

(MBC): The concentration of the test compound that completely killed the organism was taken as MBC. Samples were taken in dilution tubes and inoculated on freshly prepared nutrient agar plates and incubated at 33 °C for 28 hrs. The lowest concentration that showed no growth on plates was recorded as MBC.

Evaluation of Antioxidant Activity

Total Phenolic Content

The Total Phenolic content was determined by the Folin Ciocalteau method. The assay reaction contained the mixture of sample (0.5ml of different dilutions) with 0.25ml of Folin Ciocalteau and 0.2 ml of Sodium carbonate solution and the remaining volume made up to 10ml with distilled water. The calibration curve of polyphenols was prepared by using Gallic acid as a standard in the concentration of 10-50µg/ml and mixed with the reagents above. After 2 hrs, the absorbance was measured at 765nm to determine the total phenolic content. All determinations were carried out in triplicate. The total content of phenolic content in the extract was expressed in Gallic acid equivalents (GAE) which was calculated from the formula [11-13].

$$T = C \times V/M$$

Where T = Total phenolic content in mg/g plant extract, in GAE

C= Concentration (mg/ml) of Gallic acid obtained from the calibration curve

V= Volume of extract (ml) M= Weight (g) of plant extract

M= Weight (g) of plant extract

Hydrogen Peroxide Scavenging Activity

Hydrogen peroxide scavenging activity was determined by the method described by Sharma *et al.* Solution of hydrogen peroxide (20 mM) was prepared in phosphate buffer saline (pH 7.4). Different concentrations of standard and sample (1ml) were added to 2 ml of hydrogen peroxide solution in PBS. The observance of hydrogen peroxide at 230 NM was determined after 10 minutes against a blank solution containing phosphate buffer without hydrogen peroxide. All the data presented are average of triplicate analysis. The percentage of hydrogen peroxide scavenging by the sample and the standard was calculated as follows [14, 15].

$$\% \text{ Scavenged } H_2O_2 = [(A_0 - A_1) / A_0] \times 100$$

Where, A₀ = Absorbance of Control

A₁ = Absorbance in the presence of sample and standard

3. RESULTS

In-vitro Antibacterial Activity The *Phyllanthus Emblica* powder was tested against four strains of bacteria namely *E.coli*, *S.aureus*, *Pseudomonas fluorescens*, and *Bacillus subtilis*. It showed maximum zone of inhibition against *Bacillus subtilis* and lowest against *E.coli*. The results of antibacterial activity measured in terms of the diameter of zone of inhibition in mm are shown in table 1. The *Phyllanthus Emblica* juice powder exhibited ZOI values which are dose-dependent. The ZOI values increased as the concentration increased. Gentamicin (10µg/ml) was used as the standard antibacterial agent and it showed ZOI values against all the tested strains of bacteria. Hence it is indicated that *Phyllanthus Emblica* juice powder has great potential as antimicrobial compounds and can be used to treat infectious diseases caused by resistant microorganisms. The possible reason for antibacterial activity of *Phyllanthus Emblica* juice powder might be the presence of tannins in the fruits. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of *Phyllanthus Emblica* juice powder against the tested bacterial strains are recorded in table 2. Antimicrobial agents with low activity against an organism have a high MIC and MBC while highly active antimicrobial agents have a low MIC and MBC.

In-vitro Antifungal Activity *Phyllanthus Emblica* powder was tested for antifungal activity against four fungal strains viz. *Aspergillus niger*, *Penicillium chrysogenum*, *Alternaria alternata*, and *Fusarium* spp. The *Phyllanthus Emblica* powder showed no antifungal activity against the tested strains.

Table 1: Sensitivity test of Bacterial species on *Phyllanthus Emblica* juice powder

Zone of inhibition (in mm)				
Concentration (mg/ml)	<i>E. Coli</i>	<i>S.aureus</i>	<i>Pseudomonas fluorescens</i>	<i>Bacillus subtilis</i>
0.5	6.1	7.3	6.6	7.4
1	7.8	11	12	10
1.5	8.7	11.8	13.2	12.2
2	9.9	13	15.5	16
Gentamicin (10 µg/ml)	17	20	22	30

Table 2: Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of *Phyllanthus Emblica* juice powder

Bacterial species	MIC (mg/ml)	MBC (mg/ml)
<i>E. coli</i>	5.95	23
<i>S.aureus</i>	6.11	-
<i>Pseudomonas fluorescens</i>	3.175	24
<i>Bacillus subtilis</i>	6.20	100

Antioxidant Activity

Total Phenolic Content

The total phenolic content in the *Phyllanthus Emblica* juice powder measured by Folin Ciocalteu reagent in terms of gallic acid equivalents (GAE) was found to be 380.8mg/g.

Hydrogen Peroxide Scavenging Activity

The *Phyllanthus Emblica* juice powder was capable of scavenging hydrogen peroxide in a concentration dependent manner. The percentage reduction values for *Phyllanthus Emblica* powder and Ascorbic acid are represented in table 3. The results of present study reveal that *Phyllanthus Emblica* juice powder can scavenge free radicals or reactive oxygen species under in-vitro conditions. Scavenging of hydrogen peroxide by *Phyllanthus Emblica* powder may be attributed to the phenolic compounds. The presence of phenolic compounds and flavonoids acknowledges the antioxidant activity of the plant

Table 3: Percentage reduction of H₂O₂ by *Phyllanthus Emblica* powder and Ascorbic acid

S. No	Concentration (µg/ml)	% Reduction of H ₂ O ₂ by <i>Phyllanthus Emblica</i> powder	% Reduction of H ₂ O ₂ by Ascorbic acid
1	100	17.55	38.14
2	200	41.32	54.94
3	300	56.06	66.74
4	400	77.24	78.03
5	500	92.58	95.22

Anti-inflammatory

Albino rats of either sex weighing 100-200g were used. Total 21 rats were selected and were divided into 3 groups of 7 in each

- Group 1 (Control):** 4% Gum Acacia, 2ml/kg.
- Group 2 (Standard Drug):** Diclofenac sodium (4.5mg/kg) in 4% Gum Acacia.
- Group 3 (Test Drug):** *Phyllanthus Emblica* juice powder (540mg/kg) in distilled water.

All the drugs were administered orally followed by constant volume of distilled water after each administration to ensure the entry of drug. One hour after feeding, each rat is anaesthetized with ether and under anesthesia 0.1ml of 1% Carrageenan is injected into sub-plantar region of the hind paw of the rat and the volume of paw is measured by Plethysmograph before and after injection of 1% carrageenan [25]. Volume of edema is recorded at the end of 3 hours after Carrageenan administration. Same procedure was adopted for rats of all the groups. percent inhibition of edema in drug treated rats (standard and test drugs) is calculated by using the formula. V_c = Volume of paw edema in control animals V_t = Volume of paw edema in drug treated animals.

4. RESULT

Phyllanthus Emblica fruit juice powder exhibited significant anti-inflammatory activity in both acute as well as chronic models of inflammation, on comparison with standard drug Diclofenac sodium. According to Asmavi MZ *et al.* [16], they have evaluated the antiinflammatory activity of *Phyllanthus Emblica* aqueous extract on albino rats. Results suggested that aqueous extract of *Phyllanthus Emblica* at a dose of

200mg/kg/day, has significant anti-inflammatory activity in Carrageenan-induced hind paw edema in rats.

5. CONCLUSION

The present study concludes that *Phyllanthus Emblica* juice powder possesses high antibacterial and antioxidant properties and can be further explored in isolation of its bioactive compound.

Phyllanthus Emblica (Indian Gooseberry) promotes health by being a powerhouse of antioxidants and Vitamin C, significantly boosting immunity, improving digestion (due to fiber), supporting heart health (lowers bad cholesterol, regulates blood pressure), stabilizing blood sugar, enhancing brain function, promoting glowing skin, and strengthening hair and bones. Its anti-inflammatory and detoxifying properties also benefit the liver and overall cellular health, making it a natural tonic for various bodily systems.

REFERENCE

- Rani TJ. Consume amla, the wonder berry: see big improvement in health. *International Journal of Immunological Nursing*. 2017;3(1).
- Madhuri S, Pandey G, Verma KS. Antioxidant, immunomodulatory and anticancer activities of *Emblia officinalis*: an overview. *International Research Journal of Pharmacy*. 2011;2(8):38–42.
- Gupta P, Nain P, Sidana J. Antimicrobial and antioxidant activity of *Emblia officinalis* seed extract. *International Journal of Research in Ayurveda and Pharmacy*. 2012;3(4):591–596.
- Prananda AT, Dalimunthe A, Harahap U, Simanjuntak Y, Peronika E, et al. *Phyllanthus emblica*: a comprehensive review of its phytochemical composition and pharmacological properties. *Frontiers in Pharmacology*. 2023;14:1288618.
- Dasaroju S, Gottumukkala KM. Current trends in the research of *Emblia officinalis* (amla): a pharmacological perspective. *International Journal of Pharmaceutical Sciences Review and Research*. 2014;24(2):150–159.
- Khan KH. Roles of *Emblia officinalis* in medicine: a review. *Botany Research International*. 2009;2(4):218–228.
- Ma QG, Wang L, Liu RH, Yuan JB, Xiao H, et al. *Phyllanthus emblica* Linn: a comprehensive review of botany, traditional uses, phytonutrients, health benefits, quality markers, and applications. *Food Chemistry*. 2024;446:138891.
- Mirunalini S, Krishnaveni M. Therapeutic potential of *Phyllanthus emblica* (amla): the ayurvedic wonder. *Journal of Basic and Clinical Physiology and Pharmacology*. 2010;21(1):93–105.
- Hossain MM, Mazumder K, Hossen SMM, Tanmy TT, Rashid MJ. In vitro antibacterial and antifungal activities of *Emblia officinalis*. *International Journal of Pharmaceutical Sciences and Research*. 2012;3(4):1124–1127.
- Bhat HR, Gupta SK, Singh UP. Discovery of novel antibacterial hybrid conjugates from 4-aminoquinoline and 1,3,5-triazine. *RSC Advances*. 2012.
- Mayachiew P, Devahastin S. Antimicrobial and antioxidant activities of Indian gooseberry and galangal extracts. *LWT - Food Science and Technology*. 2008;41:1153–1159.
- Ebrahimzadeh MA, Nabavi SM, Nabavi SF, Bahramian F, Bekhradnia AR. Antioxidant and free radical scavenging activity of selected medicinal plants. *Pakistan Journal of Pharmaceutical Sciences*. 2010;23(1):29–34.
- Keser S, Celik S, Turkoglu S, Yilmaz O, Turkoglu I. Hydrogen peroxide radical scavenging and total antioxidant activity of hawthorn. *Chemistry Journal*. 2012;2(1).
- Sharma HK, Kumar A. Evaluation of total phenol, flavonoid and in vitro antioxidant activity of *Melastoma malabathricum* leaves. *Asian Journal of Chemistry*. 2011;23(1):434–438.
- Asmawi MZ, Kankaanranta H, Moilanen E, et al. Anti-inflammatory activities of *Emblia officinalis* leaf extracts. *Journal of Pharmacy and Pharmacology*. 1993;45:581–584.

Creative Commons License

This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution–Non-commercial–No Derivatives 4.0 International (CC BY-NC-ND 4.0) License. This license permits users to copy and redistribute the material in any medium or format for non-commercial purposes only, provided that appropriate credit is given to the original author(s) and the source. No modifications, adaptations, or derivative works are permitted.

Disclaimer: The views, opinions, statements, and conclusions expressed in the papers, abstracts, presentations, and other scholarly contributions included in this conference are solely those of the respective authors. The organisers and publisher shall not be held responsible for any loss, harm, damage, or consequences — direct or indirect — arising from the use, application, or interpretation of any information, data, or findings published or presented in this conference. All responsibility for the originality, authenticity, ethical compliance, and correctness of the content lies entirely with the respective authors.