

User User

Kāśāhara Mahākaṣāya An Exploratory Review of Its Constituents, Pharmacodynamic Attributes and Experimental ...

 Slot 15

Document Details

Submission ID

trn:oid::3117:545163618

Submission Date

Jan 10, 2026, 6:36 PM GMT+5:30

Download Date

Jan 10, 2026, 6:41 PM GMT+5:30

File Name

Kāśāhara Mahākaṣāya An Exploratory Review of Its Constituents, Pharmacodynamic Attributes....docx

File Size

58.3 KB

11 Pages

3,952 Words

26,871 Characters





12% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.




Filtered from the Report

- Bibliography

Match Groups

-  **23 Not Cited or Quoted 12%**
Matches with neither in-text citation nor quotation marks
-  **0 Missing Quotations 0%**
Matches that are still very similar to source material
-  **0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
-  **0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 10%  Internet sources
- 9%  Publications
- 8%  Submitted works (Student Papers)

Match Groups

- 23 Not Cited or Quoted 12%**
Matches with neither in-text citation nor quotation marks
- 0 Missing Quotations 0%**
Matches that are still very similar to source material
- 0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
- 0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 10% Internet sources
- 9% Publications
- 8% Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	Internet	saspublishers.com	2%
2	Internet	eartharxiv.org	1%
3	Publication	Muhammad Shahbaz, Mahreen Riaz, Ushna Momal, Izza Faiz Ul Rasool et al. "Gre...	1%
4	Internet	www.researchsquare.com	1%
5	Internet	www.tandfonline.com	<1%
6	Publication	Jon R. Webb. "Handbook of Spirituality, Health, and Well-Being - A Psychological P...	<1%
7	Internet	www.frontiersin.org	<1%
8	Internet	www.mdpi.com	<1%
9	Publication	U.M.G.D. De Silva, G. Mangal, A.M.H.S. Attanayake, A. Upadhyay, S.M. Vedpathak. ...	<1%
10	Internet	www.science.gov	<1%

11	Student papers	University of Stellenbosch, South Africa on 2025-09-15	<1%
12	Internet	eprints.whiterose.ac.uk	<1%
13	Internet	pericles.pericles-prod.literatumonline.com	<1%
14	Internet	www.preprints.org	<1%
15	Student papers	Florida Institute of Technology on 2025-10-09	<1%
16	Internet	gmj.ir	<1%
17	Internet	www.jmbfs.org	<1%
18	Publication	Shilpi Pathak, Abhishek Pratap, Richa Sharma, Manas Kumar Jha. "The Phyllanthu...	<1%
19	Student papers	The University of Manchester on 2020-12-13	<1%
20	Internet	www.yumpu.com	<1%

Introduction

In Ayurveda, the majority of respiratory disorders are broadly categorized under Śvāsa, which encompasses a spectrum of conditions characterized by Kāsa (cough), Śvāsakṛcchratā (dyspnoea), and Pīnasa (allergic rhinitis) as the predominant clinical manifestations. Among these, Kāsa is considered the most significant symptom, as it profoundly affects a patient's daily activities, sleep, and overall quality of life.

Ayurveda possesses an extensive repository of medicinal plants known for their efficacy in the prevention and management of respiratory ailments. In this context, Ācārya Caraka has delineated fifty Mahākaṣāya, each comprising ten herbs grouped according to specific therapeutic indications. These Carakokta Mahākaṣāya are disease-oriented and have been systematically formulated to provide clear clinical guidance to physicians.

Among these groups, the Kāśāhara Mahākaṣāya can be applied to the management of respiratory disorders where cough is the dominant symptom. Several Ayurvedic formulations have been described for respiratory care, and Kāśāhara Mahākaṣāya stands out as one of the principal formulations referenced in the Caraka Saṃhitā (Sū. 4/26) for relieving Kapha–Vāta dominant respiratory conditions.

Kāśāhara Mahākaṣāya comprises ten herbal drugs—Drākṣā (*Vitis vinifera* Linn.), Abhayā (*Terminalia chebula* Retz.), Āmalakī (*Phyllanthus emblica* L.), Pippalī (*Piper longum* Linn.), Duralabhā (*Fagonia cretica* Linn.), Śṛṅgī (*Pistacia chinensis* Bunge.), Kaṇṭakārī (*Solanum virginianum* L.), Vṛścīrā (*Boerhaavia erecta*), Punarnavā (*Boerhaavia diffusa* L.), and Tāmalakī (*Phyllanthus niruri*)—each endowed with Kāsa–Śvāsa-hara, Śothahara, Kapha–Vāta-śāmaka, and Rasāyana properties.

The aim of the present review is to explore the potential of Kāśāhara Mahākaṣāya in various respiratory disorders.

Materials And Methods

Classical literature including the Caraka Saṃhitā and other Saṃhitās such as Bhāvaprakāśa Nighaṇṭu, Rāja Nighaṇṭu, and Dhanvantari Nighaṇṭu were reviewed to extract information related to the ten ingredients of Kāśāhara Mahākaṣāya and to understand their pharmacodynamic profile, indications, and mode of action. For the contemporary review, databases such as PubMed and Google Scholar were searched using different keywords, including the scientific names of the drugs and combinations such as respiratory disorder, anti-inflammatory, antitussive, bronchodilatory, antioxidant, anti-asthmatic, immunomodulatory, and antimicrobial activities. Mainly, those research articles in which the effects of the drugs on airway inflammation were studied were included in the analysis.

Observations

Rasapañcaka

The Rasapañcaka analysis of Kāśāhara Mahākaṣāya indicates that ingredients such as Drākṣā, Punarnavā, Abhayā, Duralabhā, Āmalakī, and Tāmalakī predominantly possess Madhura, Tikta, and Kaṣāya rasa, whereas Pippalī, Śṛṅgī, and Kaṇṭakārī chiefly exhibit Kaṭu and Tikta rasa.

The Guṇa profile reflects the presence of Laghu, Tīkṣṇa, Rūkṣa, and Viśada qualities in Abhayā, Pippalī, Śṛṅgī, and Kaṇṭakārī, while Drākṣā contributes Snigdha guṇa and Āmalakī shows Guru and Śīta guṇa.

The formulation comprises a balanced combination of Uṣṇa vīrya herbs—Pippalī, Śṛṅgī, Kaṇṭakārī, Punarnavā, and Abhayā—and Śīta vīrya herbs including Drākṣā, Āmalakī, Duralabhā, and Tāmalakī.

The majority of ingredients exhibit Madhura vipāka, while Śṛṅgī, Kaṇṭakārī, and Punarnavā possess Kaṭu vipāka. With regard to Doṣaghnatā, most ingredients function as Kapha–Vātahara or Tridoṣahara.

The Rogaghnatā profile highlights therapeutic indications for Kāsa, Śvāsa, Hikkā, Pīnasa, and Ūrdhva vāta across the formulation, with additional indications such as Yakṣmā, Kṣaya, and Pārśva-pīḍā noted for Śṛṅgī, Kaṇṭakārī, and Tāmalakī.

Drākṣā (Vitis vinifera Linn.)

Drākṣā (Vitis vinifera L.) is categorized under Phala varga dravya in Ayurveda and is traditionally acclaimed as Phalottama, denoting its superior nutritive and therapeutic value. Phytochemical investigations reveal that Drākṣā is a rich repository of bioactive constituents including simple sugars, organic acids, amino acids, peptides, proteins, vitamins, carotenoids, and a broad spectrum of phenolic compounds such as flavonoids, anthocyanins, proanthocyanidins, catechins, stilbenes, and phenolic acids, which collectively contribute to its pharmacological profile. [1]

Experimental studies attribute anti-inflammatory, immunomodulatory, antioxidant, neuroprotective, and antiapoptotic actions to these constituents. [2,3] In airway inflammatory disorders, grape seed proanthocyanidin extract has been shown to attenuate airway hyperresponsiveness and eosinophilic inflammation by suppressing Th2 cytokines and inducible nitric oxide synthase expression while enhancing Interferon-γ levels. [4] Gallic acid-rich extracts have demonstrated anti-asthmatic activity through inhibition of histamine release and pro-inflammatory cytokines. [5] Drākṣā also exhibits antimicrobial activity against respiratory pathogens with additional inhibition of bacterial biofilm formation. [6,7]

Abhayā (*Terminalia chebula* Retz.)

Abhayā is a well-established Rasāyana drug in Ayurveda, extensively described for its Dīpana, Pācana, Anulomana, and Vāta–Kapha-hara properties. Classical texts indicate its use in Śvāsa, Kāsa, Pratiśyāya, and chronic inflammatory conditions. Phytochemical profiling reveals hydrolysable tannins, flavonoids, organic acids, and micronutrients contributing to its broad pharmacodynamic profile. [8,9]

Experimental studies demonstrate significant anti-inflammatory, antimicrobial, antioxidant, and immunomodulatory activities. Chebulagic acid has shown protective effects in experimental lung injury models by reducing pulmonary edema and neutrophilic inflammation. [10,11] Antitussive activity comparable to standard agents has also been demonstrated without neurotoxicity. [12]

Āmalakī (*Emblica officinalis* Gaertn.)

Āmalakī is a Rasāyana dravya described for its Vayasthāpana, Balya, and Tridoṣaghna actions with predominance of Pitta-śamana. Classical texts advocate its use in Kāsa, Śvāsa, and Rājayakṣmā. It is one of the richest sources of stabilized vitamin C along with tannoid principles such as emblicanin A and B, contributing to potent antioxidant and immunomodulatory effects. [13]

Antitussive, [14] anti-inflammatory, and cardio-respiratory protective effects [15] have been validated experimentally and clinically. Studies demonstrate suppression of cough reflex, enhancement of antioxidant defenses, and improvement in immune parameters including natural killer cell activity. [16]

Duralabhā (*Fagonia cretica* L.)

Duralabhā is described for its Raktāśodhaka, Śothahara, Jvaraghna, and Vraṇaropana properties. Phytochemical studies reveal sterols, triterpenoids, sapogenins, flavonoids, and fatty acids. [17] Experimental studies confirm antimicrobial, anti-inflammatory, antioxidant, and antipyretic activities, supporting its traditional role in respiratory and infective conditions. [17]

Śṛṅgī (*Pistacia integerrima*)

Śṛṅgī, commonly known as Karkāṭaśṛṅgī, is extensively indicated in Śvāsa, Kāsa, and Hikkā. Phytochemical investigations reveal triterpenoids and volatile constituents responsible for bronchodilatory, anti-inflammatory, and immunomodulatory actions. [18] Experimental studies demonstrate mast cell stabilization, antihistaminic activity, [19] tracheal smooth muscle relaxation, [20] and suppression of Th2 cytokines, [21] validating its role in allergic asthma and airway inflammation. [22]

Kañtakārī (*Solanum virginianum* L.)

Kaṇṭakārī is a principal drug of Daśamūla, described for Kapha–Vāta–śamana, Kāsa-hara, and Śvāsa-hara actions. Phytochemicals include steroidal alkaloids, sterols, sapogenins, and volatile compounds contributing to bronchodilatory and anti-inflammatory effects. [23]

Experimental and clinical studies demonstrate antitussive, [24] bronchodilatory, [25] mast cell stabilizing, [26] anti oxidant [27] and antimicrobial activities, [28,29] supporting its traditional use in bronchial asthma and cough.

Punarnavā (Boerhaavia diffusa L.)

Punarnavā is a Rasāyana and Śothahara dravya traditionally used in Śvāsa, Kāsa, and Śotha. Phytochemicals include boeravinones, alkaloids, flavonoids, lignans, and triterpenoids. [30]

Experimental studies validate immunomodulatory, [31] antioxidant, [32] antibacterial, [33] and anti-inflammatory actions. [34] Classical practices such as Dhūmapāna and decoctions support its expectorant and airway-clearing effects. [35]

Tāmalakī (Phyllanthus niruri L.)

Tāmalakī is described for its Pittāśamana, Rasāyana, and Śothahara properties. Phytochemicals include flavonoids, lignans, terpenoids, and phenolic acids. [36] Experimental studies demonstrate antioxidant, antimicrobial, antihistaminic, antiviral, and immunomodulatory activities, [36] including balanced activation of innate and adaptive immune responses. [37]

Pippalī (Piper longum L.)

Pippalī is a prominent Dīpanīya, Rasāyana, and Śvāsahara dravya indicated in Śvāsa, Kāsa, and Hikkā. Phytochemical constituents include alkaloids such as piperine, flavonoids, and essential oils. [38]

Experimental studies demonstrate anti-inflammatory, [39] anti-asthmatic, [40] bronchodilatory, mast cell stabilizing, [41] and immunomodulatory actions. [42] Piperine has shown protection against pulmonary inflammation by suppressing cytokine cascades and enhancing antioxidant pathways, [43] validating Pippalī as a multi-targeted therapeutic agent in respiratory disorders. [44,45]

Table 1. - Rasapañcaka & Classical Attributes of Kāśāhara Mahākaṣāya Dravyas

Dravya	Rasa	Guṇa	Vīrya	Vipāka	Doṣaghnatā	Classical Indications
Drākṣā	Madhura, Tikta, Kaṣāya	Snigdha	Śīta	Madhura	Tridoṣahara	Kāsa, Śvāsa, Dāha
Abhayā	Kaṣāya, Tikta	Laghu, Rūkṣa	Uṣṇa	Madhura	Kapha–Vātahara	Kāsa, Śvāsa, Pratiśyāya

Āmalakī	Amla (pradhāna), Madhura	Guru, Śīta	Śīta	Madhura	Tridoṣahara	Kāsa, Śvāsa, Rājayakṣmā
Duralabhā	Tikta, Kaṣāya	Laghu, Rūkṣa	Śīta	Madhura	Kapha–Pittahara	Kāsa, Śvāsa
Śrngī	Kaṭu, Tikta	Laghu, Tikṣṇa	Uṣṇa	Kaṭu	Kapha–Vātahara	Kāsa, Śvāsa, Hikkā
Kaṇṭakārī	Kaṭu, Tikta	Laghu, Rūkṣa	Uṣṇa	Kaṭu	Kapha–Vātahara	Kāsa, Śvāsa
Punarnavā	Tikta, Kaṣāya	Laghu, Rūkṣa	Uṣṇa	Kaṭu	Tridoṣahara	Śoṭha, Kāsa
Tāmalakī	Tikta, Kaṣāya	Laghu	Śīta	Madhura	Pitta–Kapha-hara	Kāsa, Śvāsa
Pippalī	Kaṭu	Laghu, Tikṣṇa	Uṣṇa	Madhura	Kapha–Vātahara	Śvāsa, Kāsa

Table 2. Experimentally Proven Pharmacological Activities Relevant to Respiratory Disorders

Dravya	Key Experimental Actions	Respiratory Relevance
Drākṣā	Anti-inflammatory, antioxidant, antiasthmatic	Reduces airway inflammation, IgE
Abhayā	Antitussive, anti-inflammatory	Cough suppression
Āmalakī	Antioxidant, immunomodulatory	Improves lung defense
Duralabhā	Antimicrobial, anti-inflammatory	Controls infection-related inflammation
Śrngī	Bronchodilatory, mast cell stabilizing	Asthma, allergy
Kaṇṭakārī	Bronchodilator, antihistaminic	Bronchial asthma
Punarnavā	Immunomodulatory, antioxidant	Allergic airway disease
Tāmalakī	Antihistaminic, antiviral	Respiratory infections
Pippalī	Anti-asthmatic, bioavailability enhancer	Chronic asthma

Discussion

The present review synthesizes classical Ayurvedic descriptions and contemporary experimental evidence to elucidate the therapeutic relevance of Kasahara Mahākāśāya dravyas—namely Drākṣā, Abhayā, Āmalakī, Duralabhā, Śrngī, Kaṇṭakārī, Punarnavā, Tāmalakī and Pippalī—in the context of bronchial asthma, allergic airway diseases and inflammatory respiratory disorders. The reviewed literature indicates that these drugs exert multi-targeted actions addressing the complex pathophysiology of asthma, which involves airway inflammation, bronchoconstriction, mucus hypersecretion, immune dysregulation, oxidative stress and recurrent infections.

A consistent observation across the reviewed herbs is their anti-inflammatory and immunomodulatory potential, which is central to asthma management. Pippalī, Śrngī, Kaṇṭakārī, Drākṣā and Punarnavā demonstrated significant suppression of pro-

inflammatory cytokines such as IL-1 β , IL-4, IL-5, IL-6, IL-13, TNF- α and IL-17, along with a reduction in eosinophilic and neutrophilic infiltration in experimental asthma models. These findings are clinically relevant, as Th2- and Th17-mediated immune responses play a pivotal role in allergic asthma and airway remodeling. The ability of Pippalī (piperine) and Śṛṅgī to modulate Th2/Th17 balance, enhance regulatory cytokines such as IL-10, IFN- γ and TGF- β , and stabilize mast cells provides a mechanistic basis for their classical indication in Tamaka śvāsa.

Bronchodilatory and antispasmodic effects of Śṛṅgī and Kaṇṭakārī have been demonstrated through direct tracheal smooth muscle relaxation mediated by calcium channel blockade, muscarinic receptor inhibition and antihistaminic activity. Pippalī and Drākṣā also exhibited protective effects against histamine-induced bronchospasm. These pharmacodynamic actions correlate well with Ayurvedic descriptions of vāta-kapha śamana and explain the observed improvements in peak expiratory flow rate, airway resistance and preconvulsive dyspnoea time in experimental and clinical studies.

Oxidative stress is increasingly recognized as a key contributor to chronic airway inflammation and steroid resistance. In this context, Āmalakī, Drākṣā, Abhayā, Punarnavā and Tāmalakī stand out due to their potent antioxidant activity, mediated by hydrolysable tannins, flavonoids, lignans and phenolic acids. Clinical evidence in chronic smokers receiving Āmalakī extract further underscores its cardiopulmonary protective role, while experimental studies on Pippalī and Śṛṅgī demonstrate activation of endogenous antioxidant pathways, including superoxide dismutase and Nrf2, along with a reduction in lipid peroxidation markers. These antioxidant effects may contribute to preservation of airway integrity and attenuation of progressive lung damage.

The reviewed drugs also exhibit notable anti-allergic and mast cell-stabilizing properties, particularly evident with Pippalī, Śṛṅgī, Kaṇṭakārī and Drākṣā. Reduction in mast cell degranulation, serum IgE levels, histamine release and capillary permeability supports their utility in allergic asthma and rhinitis. Furthermore, the antitussive actions of Kaṇṭakārī, Āmalakī, Abhayā and Punarnavā, achieved without central nervous system depression, suggest a favourable safety profile compared to narcotic antitussives and align with their long-standing traditional use.

Several drugs, including Kaṇṭakārī, Duralabhā, Tāmalakī, Drākṣā and Punarnavā, also exhibit antimicrobial and antiviral activity. Since respiratory infections often precipitate asthma exacerbations, these properties may offer additional protective benefits by reducing infective triggers and secondary inflammation. Selective antibacterial activity against pathogens such as *Staphylococcus aureus*, *Escherichia coli* and

Pseudomonas aeruginosa further supports their role in preventing complications associated with chronic airway disease.

From an Ayurvedic perspective, the convergence of rasāyana, śothahara, śvāsahara and kāśahara properties across these drugs reflects a holistic therapeutic approach that targets not only symptom relief but also immune balance, tissue nourishment and disease modification. Modern pharmacological findings corroborate these classical concepts, demonstrating that these botanicals act on multiple molecular and cellular targets rather than a single pathway.

However, despite robust experimental evidence, clinical data remain limited and heterogeneous, with variations in dosage forms, extracts and study designs. Most evidence is derived from animal models or short-term clinical studies, underscoring the need for well-designed randomized controlled trials employing standardized formulations and validated respiratory endpoints. Future research should also explore the synergistic effects of these drugs in compound formulations, as traditionally practiced, and evaluate their role as adjuvants to conventional therapy, particularly in steroid-dependent or refractory asthma.

Conclusion

The present review highlights that the drugs of Kasahara Mahākāśāya possess complementary anti-inflammatory, bronchodilatory, immunomodulatory, antioxidant and antimicrobial activities, which collectively address the multifactorial pathophysiology of asthma and allied respiratory disorders. Classical Ayurvedic indications of kāśa and śvāsa are strongly supported by contemporary experimental evidence. The multi-targeted pharmacodynamic actions of these drugs provide a rational scientific basis for their therapeutic use in respiratory care. Thus, Kasahara Mahākāśāya represents a promising integrative approach for managing chronic airway diseases.

Limitations

The evidence reviewed is predominantly derived from experimental and preclinical studies, with limited high-quality clinical trials. Considerable heterogeneity exists in terms of drug extracts, dosage forms and outcome measures, making direct comparison difficult. Many studies evaluate individual drugs rather than the Mahākāśāya as a composite formulation. Additionally, long-term safety and pharmacokinetic data remain insufficient.

Future Scope

Future research should focus on well-designed randomized controlled clinical trials using standardized formulations of Kasahara Mahākāśāya. Exploration of synergistic effects among constituent drugs and their role as adjuvants to conventional

therapy is warranted. Studies evaluating long-term outcomes, steroid-sparing potential and quality-of-life parameters will further strengthen evidence for clinical integration. Molecular studies elucidating pathways of immune modulation and airway remodeling may provide deeper mechanistic insights.

Declarations

Conflict of Interest: The author declares that they have no conflicts of interest related to this work.

Funding / Financial Support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: The author has contributed to the conception, design, data collection, analysis, drafting, and approval of the final manuscript.

Ethical Approval: Not Applicable

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgements: The authors would like to acknowledge the support of their institution, colleagues, and technical staff who contributed to this work.

Disclaimer / Views and Opinions: The opinions expressed in this article are solely those of the author and do not reflect the views of the International Journal of Ayurveda360 or its editorial board.

AI-Use Declaration: The author declares that no generative AI tools were used to create scientific content, interpret data, or draft any sections of this manuscript. AI-based tools were used solely for minor language and grammar refinements to improve clarity and readability. All scientific content, analysis, and conclusions remain the sole responsibility of the authors.

References:

1. Granato, D. (2016). Reflectance of botanical, production and geographical origin on the unique compositional traits of purple grape juices (Doctoral dissertation, Wageningen University and Research).
2. Akaberi, M., & Hosseinzadeh, H. (2016). Grapes (*Vitis vinifera*) as a potential candidate for the therapy of the metabolic syndrome. *Phytotherapy Research*, 30(4), 540-556.
3. Nassiri-Asl, M., & Hosseinzadeh, H. (2016). Review of the pharmacological effects of *Vitis vinifera* (Grape) and its bioactive constituents: an update. *Phytotherapy Research*, 30(9), 1392-1403.
4. Zhou, D. Y., Du, Q., Li, R. R., Huang, M., Zhang, Q., & Wei, G. Z. (2011). Grape seed proanthocyanidin extract attenuates airway inflammation and hyperresponsiveness in a murine model of asthma by downregulating inducible nitric oxide synthase. *Planta Medica*, 77(14), 1575-1581. <https://doi.org/10.1055/s-0030-1270957>
5. Arora, P., Ansari, S. H., Najmi, A. K., Anjum, V., & Ahmad, S. (2016). Investigation of anti-asthmatic potential of dried fruits of *Vitis vinifera* L. in animal model of bronchial asthma. *Allergy, Asthma & Clinical Immunology*, 12, 1-12. DOI: <https://doi.org/10.1186/s13223-016-0145-x>

6. Radulescu, C., Buruleanu, L. C., Nicolescu, C. M., Olteanu, R. L., Bumbac, M., Holban, G. C., & Simal-Gandara, J. (2020). Phytochemical profiles, antioxidant and antibacterial activities of grape (*Vitis vinifera* L.) seeds and skin from organic and conventional vineyards. *Plants*, 9(11), 1470.
7. Filocamo, A., Bisignano, C., Mandalari, G., & Navarra, M. (2015). In vitro antimicrobial activity and effect on biofilm production of a white grape juice (*Vitis vinifera*) extract. *Evidence-Based Complementary and Alternative Medicine*, 2015(1), 856243. DOI: <https://doi.org/10.1155/2015/856243>
8. Juang, L. J., Sheu, S. J., & Lin, T. C. (2004). Determination of hydrolyzable tannins in the fruit of *Terminalia chebula* Retz. by high-performance liquid chromatography and capillary electrophoresis. *Journal of Separation Science*, 27(9), 718-724. DOI: <https://doi.org/10.1002/jssc.200401741>
9. Pulliah T. *Encyclopedia of world medicinal plants*. New Delhi, India: Regency Pub Vol 4, pp1931-1934.
10. Xie, F. (2016). Broad-spectrum antiviral effect of chebulagic acid and punicalagin on respiratory syncytial virus infection in a BALB/c model. *Int J Clin Exp Pathol*, 9(2), 611-619.
11. Bag, A., Kumar Bhattacharyya, S., Kumar Pal, N., & Ranjan Chattopadhyay, R. (2013). Anti-inflammatory, anti-lipid peroxidative, antioxidant and membrane stabilizing activities of hydroalcoholic extract of *Terminalia chebula* fruits. *Pharmaceutical Biology*, 51(12), 1515–1520. <https://doi.org/10.3109/13880209.2013.799709>
12. ul Haq, R., Wahab, A., Ayub, K., Mehmood, K., Sherkheli, M. A., Khan, R. A., & Raza, M. (2013). Antitussive efficacy and safety profile of ethyl acetate fraction of *Terminalia chebula*. *International Scholarly Research Notices*, 2013(1), 256934. DOI: <https://doi.org/10.1155/2013/256934>
13. Variya, B. C., Bakrania, A. K., & Patel, S. S. (2016). *Emblica officinalis* (Amla): A review for its phytochemistry, ethnomedicinal uses and medicinal potentials with respect to molecular mechanisms. *Pharmacological Research*, 111, 180–200. <https://doi.org/10.1016/j.phrs.2016.06.013>
14. Nosal'ova, G., Mokry, J., & Hassan, K. T. (2003). Antitussive activity of the fruit extract of *Emblica officinalis* Gaertn. (Euphorbiaceae). *Phytomedicine*, 10(6-7), 583-589. DOI: <https://doi.org/10.1078/094471103322331872>
15. Biswas, T. K., Chakrabarti, S., Pandit, S., Jana, U., & Dey, S. K. (2014). Pilot study evaluating the use of *Emblica officinalis* standardized fruit extract in cardio-respiratory improvement and antioxidant status of volunteers with smoking history. *Journal of Herbal Medicine*, 4(4), 188-194. DOI: <https://doi.org/10.1016/j.hermed.2014.09.002>
16. Suresh, K., & Vasudevan, D. M. (1994). Augmentation of murine natural killer cell and antibody dependent cellular cytotoxicity activities by *Phyllanthus emblica*, a new immunomodulator. *Journal of Ethnopharmacology*, 44(1), 55-60. DOI: [https://doi.org/10.1016/0378-8741\(94\)90099-X](https://doi.org/10.1016/0378-8741(94)90099-X)
17. Qureshi, H., Asif, S., Ahmed, H., Al-Kahtani, H. A., & Hayat, K. (2016). Chemical composition and medicinal significance of *Fagonia cretica*: a review. *Natural Product Research*, 30(6), 625–639. <https://doi.org/10.1080/14786419.2015.1036268>
18. Ahmad, R., Almubayedh, H., Ahmad, N., Naqvi, A. A., & Riaz, M. (2020). Ethnobotany, ethnopharmacology, phytochemistry, biological activities and toxicity of *Pistacia chinensis* subsp. *integerrima*: A comprehensive review. *Phytotherapy Research*, 34(11), 2793–2819. <https://doi.org/10.1002/ptr.6720>
19. Adusumalli, S. U. R. E. N. D. R. A., Ranjit, P. M., & Harish, M. S. (2013). Antiasthmatic activity of aqueous extract of *Pistacia integerrima* galls. *Int J Pharm Pharm Sci*, 5(supplement 2), 116-21.
20. Janbaz, K. H., Hassan, W., Mehmood, H., & Gilani, A. H. (2015). Antidiarrheal, antispasmodic and bronchodilator activities of *Pistacia integerrima* are mediated through dual inhibition of

- muscarinic receptors and Ca⁺⁺ influx. *Science, Technology and Development*, 34(1), 52. DOI: https://ecommons.aku.edu/pakistan_fhs_mc_bbs/327
21. Rana, S., Shahzad, M., & Shabbir, A. (2016). *Pistacia integerrima* ameliorates airway inflammation by attenuation of TNF- α , IL-4, and IL-5 expression levels, and pulmonary edema by elevation of AQP1 and AQP5 expression levels in mouse model of ovalbumin-induced allergic asthma. *Phytomedicine*, 23(8), 838-845. DOI: <https://doi.org/10.1016/j.phymed.2016.04.006>
 22. Shirole, R. L., Shirole, N. L., Kshatriya, A. A., Kulkarni, R., & Saraf, M. N. (2014). Investigation into the mechanism of action of essential oil of *Pistacia integerrima* for its antiasthmatic activity. *Journal of Ethnopharmacology*, 153(3), 541-551. DOI: <https://doi.org/10.1016/j.jep.2014.02.009>
 23. Javaid, U., Javaid, S., Ashraf, W., Rasool, M. F., Noman, O. M., Alqahtani, A. S., ... Imran, I. (2021). Chemical Profiling and Dose-Dependent Assessment of Fear Reducing and Memory-Enhancing Effects of *Solanum virginianum* in Rats. *Dose-Response*, 19(1), 1559325821998486. <https://doi.org/10.1177/1559325821998486>
 24. Raja, W., Nosalova, G., Ghosh, K., Sivova, V., Nosal, S., & Ray, B. (2014). In vivo antitussive activity of a pectic arabinogalactan isolated from *Solanum virginianum* L. in Guinea pigs. *Journal of Ethnopharmacology*, 156, 41-46. <https://doi.org/10.1016/j.jep.2014.08.012>
 25. Govindan, S., Viswanathan, S., Vijayasekaran, V., & Alagappan, R. (2004). Further studies on the clinical efficacy of *Solanum xanthocarpum* and *Solanum trilobatum* in bronchial asthma. *Phytotherapy Research*, 18(10), 805-809. DOI: 10.1002/ptr.1555. PMID: 15551394.
 26. Vadnere, G. P., Gaud, R. S., Singhai, A. K. (2008). Evaluation of anti-asthmatic property of *Solanum xanthocarpum* flower extracts. *Pharmacol Online*, 1, 513-522.
 27. Pandey, R. K., Shukla, S. S., Jain, A., Jain, A., Gupta, V. B., Deb, L. (2018). Evaluation of comparative immunomodulatory potential of *Solanum xanthocarpum* root and fruits on experimental animal. *Indian J Pharm Educ*, 52(4 Suppl 2), 237-245. <https://doi.org/10.5530/ijper.52.4s.103>
 28. Nithya, M., Ragavendran, C., & Natarajan, D. (2018). Antibacterial and free radical scavenging activity of a medicinal plant *Solanum xanthocarpum*. *Int J Food Prop*, 21, 313-327. <https://doi.org/10.1080/10942912.2017.1409236>
 29. Pardhi, P., Jain, A. P., Ganeshpurkar, A., & Rai, G. (2010). Anti-microbial, anti-oxidant and anthelmintic activity of crude extract of *Solanum xanthocarpum*. *Pharmacog J*, 2(11), 400-404. [https://doi.org/10.1016/S0975-3575\(10\)80022-7](https://doi.org/10.1016/S0975-3575(10)80022-7)
 30. Goyal, B. M., Bansal, P., Gupta, V., Kumar, S., Singh, R., & Maithani, M. (2010). Pharmacological potential of *Boerhaavia diffusa*: an overview. *Int J Pharm Sci Drug Res*, 2(1), 17-22.
 31. Mungantiwar, A. A., Nair, A. M., Shinde, U. A., Dikshit, V. J., Saraf, M. N., Thakur, V. S., & Sainis, K. B. (1999). Studies on the Immunomodulatory Effects of *Boerhaavia diffusa* Alkaloidal Fraction. *Journal of Ethnopharmacology*, 65, 125-131. DOI: [https://doi.org/10.1016/S0378-8741\(98\)00153-6](https://doi.org/10.1016/S0378-8741(98)00153-6)
 32. Rachh, P. R., Rachh, M. R., Modi, D. C., Shah, B. N., Bhargava, A. S., Patel, N. M., & Rupareliya, M. T. (2009). In-vitro Evaluation of Antioxidant Activity of *Punarnava* (*Boerhaavia diffusa* Linn.) *Int J Pharm Res*, 1(1), 36-40.
 33. Girish, H. V., & Satish, S. (2008). Antibacterial Activity of Important Medicinal Plants on Human Pathogenic Bacteria-a Comparative Analysis. *World Applied Sciences Journal*, 5(3), 267-271. DOI: [http://www.idosi.org/wasj/wasj5\(3\)/1.pdf](http://www.idosi.org/wasj/wasj5(3)/1.pdf)
 34. Mahesh, A. R., Kumar, H., Ranganath, M. K., & Devkar, R. A. (2012). Detail study on *Boerhaavia diffusa* plant for its medicinal importance-A Review. *Res J Pharm Sci*, 1(1), 28-36.
 35. Sasi kala, M., Vijay, S. K., & Gauthaman, K. (2009). Relevance of the use of Alternative Medicine for Bronchial Asthma: A review. *J Young Pharm*, 1(2), 184-189. DOI: 10.4103/0975-1483.55754

36. Bagalkotkar, G., Sagineedu, S. R., Saad, M. S., & Stanslas, J. (2006). Phytochemicals from *Phyllanthus niruri* Linn. and their pharmacological properties: a review. *Journal of Pharmacy and Pharmacology*, 58(12), 1559-1570. DOI: <https://doi.org/10.1211/jpp.58.12.0001>
37. Nworu, C. S., et al. (2010). The effects of *Phyllanthus niruri* aqueous extract on the activation of murine lymphocytes and bone marrow-derived macrophages. *Immunol Invest*, 39, 245–267. DOI: <https://doi.org/10.3109/08820131003599585>
38. Yadav, V., Krishnan, A., & Vohora, D. (2020). A systematic review on *Piper longum* L.: Bridging traditional knowledge and pharmacological evidence for future translational research. *Journal of Ethnopharmacology*, 247, 112255. <https://doi.org/10.1016/j.jep.2019.112255>
39. Wang, B., Zhang, Y., Huang, J., Dong, L., Li, T., & Fu, X. (2017). Anti-inflammatory activity and chemical composition of dichloromethane extract from *Piper nigrum* and *P. longum* on permanent focal cerebral ischemia injury in rats. *Revista Brasileira de Farmacognosia*, 27(3), 369-374. DOI: <https://doi.org/10.1016/j.bjp.2017.02.003>
40. Vaghasiya, Y., Nair, R., & Chanda, S. (2007). Investigation of Some *Piper* Species for Anti-Bacterial and Anti-Inflammatory Property. *International Journal of Pharmacology*, 3(5), 400-405.
41. Choudhary, G. P. (2006). Mast cell stabilizing activity of *Piper longum* Linn. <http://medind.nic.in/iac/to6/i2/iacto6i2p112.pdf>
42. Kaushik, D., Rani, R., Kaushik, P., Sacher, D., & Yadav, J. (2012). In vivo and in vitro antiasthmatic studies of plant *Piper longum* Linn. *Int J Pharmacol*, 8(3), 192-197. DOI: 10.3923/ijp.2012.192.197
43. Saha, P., Durugkar, S., Jain, S., Shantanu, P. A., Panda, S. R., Jala, A., ... & Naidu, V. G. M. (2022). Piperine attenuates cigarette smoke-induced oxidative stress, lung inflammation, and epithelial-mesenchymal transition by modulating the SIRT1/Nrf2 axis. *International Journal of Molecular Sciences*, 23(23), 14722. DOI: <https://doi.org/10.3390/ijms232314722>
44. Aswar, U., Shintre, S., Chepurwar, S., & Aswar, M. (2015). Antiallergic effect of piperine on ovalbumin-induced allergic rhinitis in mice. *Pharmaceutical Biology*, 53(9), 1358-1366. DOI: <https://doi.org/10.3109/13880209.2014.982299>
45. Kim, S. H., & Lee, Y. C. (2009). Piperine inhibits eosinophil infiltration and airway hyperresponsiveness by suppressing T cell activity and Th2 cytokine production in the ovalbumin-induced asthma model. *Journal of Pharmacy and Pharmacology*, 61(3), 353-359. DOI: <https://doi.org/10.1211/jpp.61.03.0010>

Open Access: This article is published under a **CC BY 4.0 License**, permitting unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. (<https://creativecommons.org/licenses/by/4.0/>)