ISSN NO.

IJRNCISM: International Journal of Research in Nobel Classical Indian System of Medicine

www.ncismjournal.com

Volume: 01 Issue: 03 August - 2026

Article History: Received: 04-08-2026 Accepted: 05-08-2026 Published: 30-08-2026

Ayurvedic Medicinal Plants as Natural Immunomodulators: A Critical Review of Classical Concepts and Modern Evidence

Dr. Hitesh Ramchandra Thakare[1], Dr. Ashwini G. Bobade[2], Dr. Renuka Manohar Devhare[3]

[1] Assistant Professor, Department of Dravyaguna Vigyan, KVTR Ayurveda College, Boradi, Ta-Shirpur, Dist-Dhule, Maharashtra, India. Email: hiteshthakare19@gmail.com

[2] Associate Professor, Department of Dravyaguna Vigyan, Government Ayurved College & Hospital, Jalgaon, Maharashtra, India. Email: agbobade@gmail.com

[3] Assistant Professor, Department of Dravyaguna Vigyana, Government Ayurved College & Hospital, Jalgaon, Maharashtra, India. Email: renukadevhare26@gmail.com

Abstract

The immune system protects against infection and malignant change while also regulating inflammation, tissue repair, and physiological homeostasis. Because immune dysfunction contributes to recurrent infection, allergy, autoimmunity, and chronic inflammatory disease, medicinal plants are increasingly studied as possible immunomodulators. Ayurveda approaches resistance to illness through the related concepts of *Vyadhikshamatva*, *Bala*, *Ojas*, *Agni*, healthy *Dhatu* formation, and *Rasayana*. This narrative review examines important Ayurvedic medicinal plants in the light of classical use and contemporary immune research. The *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Bhava Prakasha Nighantu*, and *Dhanvantari Nighantu* were reviewed together with literature identified through PubMed, Scopus, Web of Science, and Google Scholar. *Guduchi* (*Tinospora cordifolia*), *Ashwagandha* (*Withania somnifera*), *Amalaki* (*Emblica officinalis*), *Tulsi* (*Ocimum sanctum*), *Yashtimadhu* (*Glycyrrhiza glabra*), and *Haridra* (*Curcuma longa*) have demonstrated antioxidant, anti-inflammatory, or immune-related effects in experimental studies. Clinical evidence, however, is uneven and depends on the preparation, dose, population, and outcome. “Immune boosting” is therefore an inadequate description: stimulation may be undesirable in autoimmune or inflammatory conditions, and an immunomodulatory effect must be defined for a specific clinical context. Ayurvedic plants may have supportive value, but standardized products, credible comparators, clinically meaningful endpoints, and systematic safety monitoring are needed before disease-specific protocols can be recommended.

Keywords

Immunomodulation; Ayurveda; medicinal plants; *Ojas*; *Rasayana*; *Vyadhikshamatva*; herbal medicine

1. Introduction

Immunity is produced by an interconnected network of barriers, cells, tissues, soluble mediators, and signaling pathways. It must recognize and control infectious organisms and abnormal cells while limiting unnecessary damage to healthy tissue [1]. Failure of this regulation may appear as recurrent infection, allergy, autoimmune disease, persistent inflammation, or impaired responses associated with ageing and metabolic illness [2].

Vaccination, antimicrobial treatment, immunosuppressive medicines, biological agents, and targeted immune therapies have transformed clinical care. Each is used for a defined indication, and their limitations cannot be reduced simply to adverse effects or cost [3]. Interest in herbal products should therefore focus on whether a standardized intervention adds a measurable and safe benefit, not on the assumption that "natural" means universally safer.

Ayurveda does not confine resistance to disease to one anatomical system. *Vyadhikshamatva* describes the capacity to oppose the occurrence or severity of illness, while *Bala* refers to strength and functional resilience. *Ojas*, appropriate *Agni*, balanced *Dosha*, and well-formed *Dhatu* are considered essential to sustained health [4]. Plants described as *Rasayana* are relevant because their use is directed toward longevity, nourishment, recovery, and resistance rather than toward indiscriminate stimulation of immunity.

Aim and Objectives

The review aims to critically evaluate Ayurvedic medicinal plants as possible natural immunomodulators by bringing classical concepts into conversation with modern evidence. It summarizes innate and adaptive immunity, examines *Vyadhikshamatva*, *Ojas*, *Agni*, and *Rasayana*, reviews selected plants and formulations, and identifies safety concerns and priorities for future research.

2. Methodology of Literature Review

A narrative review was conducted using the *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Bhava Prakasha Nighantu*, and *Dhanvantari Nighantu*. PubMed, Scopus, Web of Science, and Google Scholar were searched using combinations of "immunomodulatory plants," "Ayurveda *Rasayana*," "*Vyadhikshamatva*," "herbal immunity," and "*Tinospora cordifolia* immunity." Classical references, experimental studies, and clinically relevant human research were considered. Duplicate publications, unauthenticated sources, and reports unrelated to immune function were excluded. Because the search was narrative and the evidence heterogeneous, the review does not provide a pooled estimate of efficacy.

3. Modern Concept of Immunity

Innate immunity provides rapid, broadly directed defense through physical and chemical barriers, phagocytes, dendritic cells, natural killer cells, complement, and inflammatory mediators. Adaptive immunity develops antigen-specific responses through T lymphocytes, B lymphocytes, and antibodies and can generate immunological memory [5]. The two arms are not isolated: antigen presentation, cytokines, cellular metabolism, microbiota, and neuroendocrine signals continuously connect them. A useful immunomodulator might enhance a deficient response, restrain pathological inflammation, or improve resolution; the desired direction depends on the disorder.

4. Immunity in Ayurveda

Vyadhikshamatva includes the ability to prevent disease from becoming established and to limit its progression once it occurs. It depends on constitutional and acquired strength, tissue quality, digestive and metabolic competence, mental state, age, season, diet, and conduct [6]. *Bala* is therefore broader than a laboratory immune count.

Ojas is described as the refined essence associated with stability, vitality, and survival. Its depletion is linked with weakness and vulnerability, but *Ojas* should not be translated as an individual cytokine, immunoglobulin, or cell population. *Agni* provides another essential connection: impaired transformation can lead to poor nourishment and *Ama*, whereas effective digestion and tissue metabolism support orderly *Dhatu* formation. Together these concepts explain why Ayurvedic immune care includes food, sleep, activity, mental health, and digestion alongside medicines.

5. Concept of *Rasayana*

Rasayana comprises measures intended to promote healthy longevity, strength, cognition, tissue nourishment, and resistance to illness [7]. It includes conduct and routine as well as medicines. The category does not imply that every *Rasayana* herb has the same pharmacological action. A plant may influence oxidative stress, inflammatory signaling, stress physiology, barrier function, or recovery, and these effects must be studied separately for the preparation and clinical population concerned.

6. Ayurvedic Medicinal Plants as Immunomodulators

Guduchi (*Tinospora cordifolia*) is a prominent *Rasayana* whose stem is widely used. Experimental studies describe effects on macrophage activity, cytokine signaling, and antioxidant defenses [8]. These findings have encouraged clinical interest, but they do not justify unsupervised use for every infection or inflammatory disorder. Product authenticity and liver safety require particular attention.

Ashwagandha (*Withania somnifera*) is selected when reduced strength, stress, or disturbed sleep accompanies illness. Research suggests adaptogenic and anti-inflammatory effects and possible changes in selected immune measures [9]. Its clinical value is more plausibly linked to a defined stress or recovery outcome than to a general claim of enhanced immunity. Thyroid disease, sedation, pregnancy, and medicine interactions should be considered.

Amalaki (*Emblica officinalis*) provides polyphenols and other antioxidant constituents and is central to several *Rasayana* preparations [10]. *Tulsi* (*Ocimum sanctum*) has shown anti-inflammatory, antioxidant, and antimicrobial activities in preclinical studies, with limited human evidence for respiratory and stress-related outcomes. *Yashtimadhu* (*Glycyrrhiza glabra*) has soothing and anti-inflammatory properties relevant to mucosal conditions [11], but prolonged or excessive exposure to glycyrrhizin can cause hypertension, hypokalemia, and fluid retention.

Neem (*Azadirachta indica*) and *Haridra* (*Curcuma longa*) have been investigated for antimicrobial and inflammation-related effects [12,13]. *Neem* is not an everyday tonic and requires careful indication and dosing. Curcumin research is extensive, but bioavailability and formulation differences make results difficult to generalize. *Shatavari* (*Asparagus racemosus*) is a nourishing *Rasayana* with preliminary adaptogenic and immune findings [14], while *Brahmi* (*Bacopa monnieri*) is studied chiefly for cognition and stress rather than direct clinical immune outcomes [15].

7. Classical Formulations

Chyawanprasha is a polyherbal *Rasayana* centered on *Amalaki* and traditionally used to support strength and respiratory health. Its composition, sugar content, manufacturing process, and serving size vary across products. *Guduchi Satva* and *Ashwagandha Rasayana* are likewise used according to the patient's *Agni*, *Bala*, age, and clinical condition. These formulations should not be assigned a single universal dose or duration without considering product specification, metabolic disease, concurrent treatment, and the purpose for which they are prescribed.

8. Possible Mechanisms of Herbal Immunomodulation

Plant constituents may affect nuclear transcription pathways, cytokines, phagocyte function, lymphocyte activity, oxidative balance, and cellular stress responses [16]. Antioxidant activity can protect cells from excessive oxidative injury, but a high in-vitro antioxidant value does not prove clinical benefit. Adaptogenic effects may indirectly influence immune regulation through sleep and hypothalamic-pituitary-adrenal signaling.

The intestinal microbiome and mucosal barrier are also central to immune development and regulation. Diet and herbal preparations can alter microbial metabolism, but claims that a particular plant "balances the microbiome" require direct human evidence [17]. Mechanistic studies are most informative when they use clinically achievable exposure and are connected to outcomes that matter to patients.

9. Critical Analysis: Ayurveda and Modern Immunology

Conceptual comparison can generate hypotheses, but direct equivalence is misleading. *Vyadhikshamatva* is not identical to immune competence, *Ojas* is not an immune molecule, *Agni* is

not metabolic rate, and *Ama* is not a specific inflammatory marker. Ayurvedic assessment is person-centered and functional, whereas modern immunology measures defined cells, mediators, pathways, and clinical endpoints. Their most productive intersection lies in testing whether a clearly characterized intervention, selected through transparent Ayurvedic reasoning, changes a meaningful outcome and an accompanying biological marker.

Modern or functional idea	Ayurvedic concept used for comparison
Constitutional and acquired strength	*Bala*
Capacity to resist occurrence or severity of disease	*Vyadhikshamatva*
Vital stability and refined tissue essence	*Ojas*
Digestion and transformation	*Agni*
Inadequately processed material	*Ama*
Healthy-ageing and restorative approach	*Rasayana*

10. Clinical Applications

Potential areas of study include recurrent respiratory illness, recovery after stress or prolonged disease, selected age-related changes, and adjunctive management of chronic inflammatory conditions. These are research directions rather than established blanket indications. Treatment must account for *Prakriti*, *Bala*, *Agni*, disease state, and the conventional diagnosis. Fever, immunodeficiency, autoimmune disease, cancer, and persistent recurrent infection require appropriate investigation and should not be managed solely with over-the-counter "immunity" products.

11. Safety Considerations

Herbal safety depends on correct botanical identity, the plant part, cultivation and processing, extraction method, dose, contaminants, adulterants, and patient susceptibility. Clinicians should ask about pregnancy, liver and kidney disease, hypertension, diabetes, thyroid disorders, allergy, and concurrent immunosuppressive, anticoagulant, or other medicines. Adverse events and suspected herb–drug interactions should be documented. The possibility that an immune-active herb could worsen autoimmunity or interfere with treatment deserves more study.

12. Research Gaps and Limitations

Most evidence remains experimental, while human trials are frequently small, short, or based on poorly characterized products. Extracts with different chemical profiles are often discussed as though interchangeable. Future randomized trials should register protocols, authenticate materials, define active constituents where possible, justify dose, and report adherence and adverse events. Outcomes should include disease-specific clinical measures rather than isolated cytokine changes alone. Pharmacokinetic and interaction studies are also needed.

13. Future Perspectives

Systems biology, metabolomics, genomics, and microbiome research may help explain why complex preparations affect several pathways, but these technologies should complement—not replace—sound clinical trials. A promising model would combine explicit Ayurvedic phenotyping with standardized interventions and modern immune endpoints. Such research could determine whether *Prakriti* or *Agni*-related features predict response and whether *Rasayana* care contributes to healthy ageing beyond general lifestyle improvement.

14. Conclusion

Ayurveda describes resistance to illness through *Vyadhikshamatva*, *Bala*, *Ojas*, *Agni*, *Dhatu* health, and *Rasayana*. *Guduchi*, *Ashwagandha*, *Amalaki*, *Tulsi*, *Yashtimadhu*, and *Haridra* contain biologically active constituents with antioxidant, anti-inflammatory, or immune-related effects, but the strength of clinical evidence differs widely. These plants are better understood as possible modulators used for defined purposes than as universal "immune boosters." Their responsible integration requires authentic standardized products, individualized selection, awareness of adverse effects and interactions, and high-quality trials using clinically meaningful outcomes.

15. References

1. Murphy K, Weaver C. Janeway's Immunobiology. 10th ed. New York: Garland Science; 2022. p.1–50.
2. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. 10th ed. Philadelphia: Elsevier; 2021. p.1–80.
3. Delves PJ, Martin SJ, Burton DR, Roitt IM. Roitt's Essential Immunology. 13th ed. Wiley Blackwell; 2017. p.100–150.
4. Charaka. *Charaka Samhita*, Sutrasthana, Chapter 28. Reprint edition. Varanasi: Chaukhamba Bharati Academy; 2014. p.550–580.
5. Sushruta. *Sushruta Samhita*, Sutrasthana, Chapter 15. Reprint edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2015. p.70–90.
6. Vagbhata. *Ashtanga Hridaya*, Sutrasthana, Chapter 11. Reprint edition. Varanasi: Chaukhamba Surbharati; 2016. p.150–170.
7. Sharma PV. *Charaka Samhita* with English Translation. Varanasi: Chaukhamba Orientalia; 2014. p.700–760.
8. Upadhyay AK, Kumar K, Kumar A, Mishra HS. *Tinospora cordifolia* immunomodulatory activity. Indian Journal of Pharmacology. 2010;42(2):123–129.
9. Lopresti AL, Smith SJ, Malvi H, Kodgule R. *Ashwagandha* supplementation and stress. Medicine. 2019;98:e17186.
10. Baliga MS, Dsouza JJ. Amla and its medicinal properties. Food Research International. 2011;44:279–288.
11. Fiore C, Eisenhut M, Ragazzi E, et al. *Glycyrrhiza glabra* immunological effects. Phytotherapy Research. 2008;22:141–148.
12. Subapriya R, Nagini S. *Neem* and cancer prevention. Indian Journal of Physiology and Pharmacology. 2005;49:177–186.
13. Hewlings SJ, Kalman DS. Curcumin review. Foods. 2017;6:92.
14. Alok S, Jain SK, Verma A. *Asparagus racemosus* pharmacological review. Asian Pacific Journal of Tropical Disease. 2013;3:242–251.
15. Pase MP, Kean J, Sarris J. *Bacopa monnieri* cognitive effects. Journal of Ethnopharmacology. 2012;141:33–39.
16. Ghasemian M, Owlia S, Owlia MB. Review of anti-inflammatory herbal mechanisms. Journal of Research in Medical Sciences. 2016;21:1–10.
17. Tilg H, Cani PD, Mayer EA. Gut microbiome and metabolic disease. Nature Reviews Immunology. 2016;16:497–509.
18. Sharma H, Chandola HM. Ayurvedic approach to immune health. AYU. 2011;32(3):299–304.
19. Singh RH. Exploring issues in Ayurveda research methodology. AYU. 2011;32(3):299–304.
20. Patwardhan B, Vaidya ADB. Ayurveda and integrative medicine. Journal of Ayurveda and Integrative Medicine. 2015;6(1):1–3.
21. Bhavamishra. *Bhava Prakasha Nighantu*. Reprint edition. Varanasi: Chaukhamba Bharati Academy; 2015. p.200–350.
22. Sharma RK, Dash B. *Agni*vesha *Charaka Samhita*. Varanasi: Chaukhamba Sanskrit Series; 2014. p.400–500.
23. Dahanukar SA, Kulkarni RA, Rege NN. Pharmacology of medicinal plants. Indian Journal of Pharmacology. 2000;32:S81–S118.
24. Patwardhan B. Traditional medicine and modern science. Current Science. 2005;86:789–799.
25. World Health Organization. WHO Traditional Medicine Strategy 2014–2023. Geneva: WHO; 2013.
26. Williamson EM. Major Herbs of Ayurveda. London: Churchill Livingstone; 2002. p.1–100.
27. Meulenbeld GJ. A History of Indian Medical Literature. Vol IA. Groningen: Forsten Publications; 1999. p.200–300.
28. Wujastyk D. The Roots of Ayurveda. London: Penguin Classics; 2003. p.1–80.