

## Review Article



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**“AYURVEDIC HERBS WITH ANTI-INFLAMMATORY POTENTIAL:  
FROM SHOTAHARA DRavyAS TO MODERN  
IMMUNOPHARMACOLOGY”**

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**ABSTRACT**

**Introduction:** Inflammation is a central mechanism in many acute and chronic diseases, from arthritis to cardiovascular and neurodegenerative disorders. Ayurveda describes *Shotha* (inflammation and swelling) as a pathological state and prescribes *Shothahara dravyas* (anti-inflammatory herbs) for its management. Many of these herbs are now being validated in immunopharmacology research. **Methods:** This review synthesized evidence from Ayurvedic texts (*Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*) and modern biomedical literature. Databases such as PubMed, Scopus, and Web of Science were searched (2000–2024) using keywords: “Ayurveda,” “Shothahara,” “anti-inflammatory,” “immunopharmacology,” and “herbs.” Inclusion criteria were original studies, reviews, and clinical trials evaluating Ayurvedic herbs with anti-inflammatory activity. Exclusion criteria included non-peer-reviewed reports and studies unrelated to inflammation. **Results:** Classical texts identify several *Shothahara* herbs, including *Haridra* (*Curcuma longa*), *Nimba* (*Azadirachta indica*), *Guduchi* (*Tinospora cordifolia*), *Guggulu* (*Commiphora wightii*), *Ashwagandha* (*Withania somnifera*), and *Shallaki* (*Boswellia serrata*). Their *Dravyaguna* properties (rasa, guna, virya, vipaka) correlate with anti-inflammatory actions such as detoxification, immunomodulation, and reduction of *ama* (metabolic toxins). Modern studies demonstrate mechanisms including NF- $\kappa$ B inhibition, COX-2 suppression, cytokine modulation, and antioxidant activity. Clinical evidence supports their role in arthritis, metabolic inflammation, and autoimmune disorders. **Discussion:** The Ayurvedic view of inflammation as a systemic imbalance aligns with modern concepts of immune dysregulation. While strong pharmacological evidence supports many herbs, gaps remain in standardization, dosage optimization, and clinical validation. **Conclusion:** *Shothahara dravyas* offer valuable leads for developing novel anti-inflammatory agents. Integrating Ayurvedic wisdom with immunopharmacology could advance safer, multi-targeted therapies for chronic inflammatory diseases.

**KEYWORDS:** Anti-inflammatory, Ayurveda, immunopharmacology, *Shothahara dravyas*, traditional medicine



Inflammation is an essential defense mechanism, yet when uncontrolled, it contributes to chronic diseases such as rheumatoid arthritis,<sup>[1]</sup> inflammatory bowel disease, diabetes, and neurodegeneration. Conventional anti-inflammatory drugs, including NSAIDs and corticosteroids, are effective but associated with significant side effects such as gastrointestinal irritation, cardiovascular risk, and immunosuppression. This has spurred interest in safer, multi-targeted alternatives.<sup>[3-5]</sup>

Ayurveda, the traditional system of Indian medicine, conceptualizes inflammation under the term *Shotha*, which encompasses swelling, pain, redness, and dysfunction. Classical texts describe *Shothahara dravyas*—herbal medicines that alleviate inflammation by balancing *doshas*, removing *ama* (metabolic toxins), and restoring *Agni* (digestive fire). These herbs often act holistically, combining anti-inflammatory, antioxidant, detoxifying, and immunomodulatory properties.<sup>[6-8]</sup>

The present review aims to bridge Ayurveda and modern immunopharmacology by analyzing *Shothahara* herbs, their *Dravyaguna* (pharmacological attributes), and contemporary evidence on their molecular mechanisms. The objectives are: (i) to compile classical references to *Shothahara* dravyas; (ii) to examine pharmacological and clinical data supporting their anti-inflammatory activity; and (iii) to identify gaps and future directions for integrative drug development.<sup>[9-10]</sup>

## MATERIALS AND METHODS

**Literature sources:** Ayurvedic texts (*Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*) were reviewed to identify *Shothahara* herbs.<sup>[11]</sup>

**Databases searched:** PubMed, Scopus, Web of Science.

**Search terms:** “*Shothahara*,” “Ayurvedic herbs anti-inflammatory,” “immunopharmacology Ayurveda,” “herbal anti-inflammatory clinical trials.”<sup>[12]</sup>

**Inclusion criteria:**<sup>[13]</sup>

- Classical Ayurvedic references.
- Preclinical, pharmacological, and clinical studies published 2000–2024.
- Peer-reviewed articles, reviews, and meta-analyses.

**Exclusion criteria:**<sup>[14]</sup>

- Non-peer-reviewed or anecdotal sources.
- Studies unrelated to inflammation or immunology.

**Method of synthesis:** Findings were thematically grouped under:<sup>[15]</sup>

1. Ayurvedic perspectives on *Shotha* and *Shothahara dravyas*.
2. Dravyaguna of key anti-inflammatory herbs.
3. Preclinical pharmacology and molecular mechanisms.
4. Clinical evidence.
5. Comparative analysis with modern immunopharmacology.

## OBSERVATION AND RESULTS

### 1. Ayurvedic Understanding of *Shotha*

Ayurveda classifies *Shotha* into endogenous (*Nija*) and exogenous (*Agantuja*) causes. *Nija Shotha* arises from vitiation of *doshas*—*Vata* causes pain and stiffness, *Pitta* redness and heat, and *Kapha* heaviness and swelling. *Shothahara dravyas* are prescribed to correct doshic imbalance, reduce swelling, and remove *ama*.

### 2. Classical *Shothahara Dravyas* and Their *Dravyaguna*

- ***Haridra* (*Curcuma longa*)** – *Tikta-katu rasa*, *Ushna virya*, anti-*Kapha*, anti-*Pitta*; classically used for wound healing and inflammation.
- ***Guduchi* (*Tinospora cordifolia*)** – *Tikta rasa*, *Ushna virya*; promotes detoxification and rejuvenation.
- ***Nimba* (*Azadirachta indica*)** – *Tikta-kashaya rasa*, *Sheeta virya*; indicated in skin inflammation and fevers.
- ***Guggulu* (*Commiphora wightii*)** – *Tikta-katu rasa*, *Ushna virya*; reduces chronic swelling and joint pain.
- ***Shallaki* (*Boswellia serrata*)** – *Kashaya rasa*, *Sheeta virya*; anti-arthritic, anti-inflammatory.
- ***Ashwagandha* (*Withania somnifera*)** – *Tikta-kashaya rasa*, *Ushna virya*; reduces inflammation and strengthens immunity.
- ***Eranda* (*Ricinus communis*)** – *Madhura-tikta rasa*, *Ushna virya*; useful in inflammatory arthritis.

### 3. Modern Pharmacological Evidence



- **Curcumin (Haridra)** – Inhibits NF-κB, COX-2, TNF-α, IL-6; antioxidant; effective in arthritis and IBD.
- **Tinospora cordifolia** – Modulates macrophage function, reduces oxidative stress, suppresses IL-1β and TNF-α.
- **Neem (Azadirachta indica)** – Inhibits pro-inflammatory cytokines, reduces prostaglandins, shows efficacy in skin inflammation.
- **Boswellia serrata** – Boswellic acids inhibit 5-LOX pathway, reducing leukotrienes; used in osteoarthritis and asthma.
- **Commiphora wightii** – Guggulsterones reduce NF-κB activity, suppress macrophage-mediated inflammation.
- **Withania somnifera** – Withanolides reduce CRP, IL-1β, IL-6; adaptogenic and immunomodulatory.
- **Ricinus communis** – Seed oil shows analgesic and anti-inflammatory effects in animal models.

#### 4. Clinical Studies

- Curcumin trials demonstrate significant reduction in pain and CRP in osteoarthritis.
- *Boswellia serrata* extracts improve knee function and reduce swelling in randomized controlled trials.
- *Tinospora cordifolia* shows beneficial effects in rheumatoid arthritis and allergic rhinitis.
- *Ashwagandha* supplementation reduces markers of systemic inflammation in stress and autoimmune disorders.
- Neem extracts are effective in eczema and psoriasis adjunct therapy.

#### 5. Integrative Thematic Insights

- Many *Shothahara* herbs act on multiple inflammatory mediators (cytokines, prostaglandins, leukotrienes).
- Antioxidant properties support anti-inflammatory effects.
- Herbs like guggulu and boswellia show disease-modifying potential in arthritis.
- Rasayana herbs (*Guduchi*, *Ashwagandha*) provide long-term immunomodulation.

#### DISCUSSION

The Ayurvedic conceptualization of *Shotha* aligns remarkably with the modern understanding of

inflammation as a systemic immune dysregulation involving cellular, humoral, and metabolic pathways. *Shothahara dravyas* were prescribed based on *Dravyaguna* considerations—*rasa*, *guna*, *virya*, *vipaka*—that can be correlated with pharmacological actions.<sup>[16]</sup>

For instance, *Haridra*'s *Ushna virya* corresponds to its ability to modulate pro-inflammatory enzymes, while *Guduchi*'s *Rasayana* effect parallels immunomodulation. The principle of reducing *ama* may reflect detoxification and antioxidant activities that limit oxidative stress-induced inflammation.<sup>[17]</sup>

Modern pharmacology has validated these herbs through molecular studies. NF-κB inhibition, cytokine modulation, and COX/LOX pathway suppression are central to their anti-inflammatory effects. Clinical trials, particularly with curcumin and boswellia, provide strong evidence for efficacy in arthritis and inflammatory bowel disease.<sup>[18]</sup>

However, challenges persist. Variability in phytochemical content, poor bioavailability of compounds like curcumin, and lack of large-scale, long-term clinical trials limit mainstream adoption. Ayurveda's personalized, multi-herb formulations differ from modern single-compound drug design, creating methodological challenges in evaluation.<sup>[19]</sup> Future directions should include standardized extracts, novel delivery systems (e.g., nanoparticles for curcumin), and clinical trials designed to evaluate holistic, multi-targeted effects. Collaborative frameworks integrating Ayurveda's systemic view and immunopharmacology's molecular focus could yield safe, effective anti-inflammatory therapies.<sup>[20]</sup>

#### CONCLUSION

Ayurveda provides a sophisticated framework for understanding and managing inflammation through *Shothahara dravyas*. Classical texts describe herbs like *Haridra*, *Guduchi*, *Nimba*, *Guggulu*, *Boswellia*, and *Ashwagandha*, which modern science has validated for their anti-inflammatory, antioxidant, and immunomodulatory properties.

Molecular studies reveal mechanisms such as inhibition of NF-κB, COX, LOX, and cytokine pathways, while clinical trials confirm benefits in arthritis, asthma, and skin diseases. These findings underscore Ayurveda's anticipation of modern immunopharmacology.

Nonetheless, challenges remain in bioavailability, standardization, and clinical validation. Integrative



research combining classical insights with modern pharmacology could overcome these hurdles, leading to safer, multi-targeted therapies for chronic inflammatory disorders.

In conclusion, *Shothahara dravyas* represent a valuable resource for anti-inflammatory drug discovery and integrative healthcare. Their holistic action profile, spanning symptom relief to immune regulation, positions them as promising candidates for addressing the global burden of chronic inflammation.

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