

A COMPREHENSIVE REVIEW ON EXPLORING THE THERAPEUTIC POTENTIAL OF CONVENTIONAL HERBAL MEDICINES FOR ACUTE AND CHRONIC INFLAMMATORY CONDITIONS

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ABSTRACT

Herbal plants have been used for centuries to alleviate inflammation, a condition underlying various diseases. This review paper aims to provide a comprehensive overview of anti-inflammatory herbal plants, including their traditional uses, bioactive compounds, and scientific evidence. We will explore the mechanisms of action, preclinical and clinical studies, and potential interactions of popular herbal plants

1. INTRODUCTION

Inflammation is our body's way of defending itself against harmful things like allergens or injuries. But when inflammation gets out of control, it can lead to a lot of different health problems like allergies, heart issues, and cancer. This can be costly for both individuals and society.

There are different medicines for calming inflammation, like steroids and nonsteroidal anti-inflammatory drugs. However, these can have negative effects. Our aim is to use the smallest amount needed to be effective and avoid side effects. So, we should incorporate natural anti-inflammatory elements into medication to boost the benefits and reduce unwanted side effects.

Studying herbal medicines is important in medicine, and we need to learn more about them. Complementary, alternative, and traditional medicines provide guidance on herbal treatments, but modern medicine needs to scientifically validate these guidelines before using them. In this review, we've tried to evaluate plants with the most clinical evidence of their anti-inflammatory effects.

2. OBJECTIVE

We want to emphasize the significance of both synthetic drugs and natural herbs for their anti-inflammatory properties. This includes understanding their components, how they work, their advantages, drawbacks, and what the future holds for them. Ultimately, our goal is to ensure all patients receive quality healthcare regardless of their background, promoting equality in healthcare services.

ANTI-INFLAMMATORY PLANTS

1) Curcuma longa:-



Turmeric, known as زردچوبه in Persian, cúrcuma in Spanish, हल्दी in Hindi, and عقدة الصفراء in Arabic, is a native plant of India. The primary secondary metabolite found in *C. longa* is curcumin, which contributes to the plant's anti-inflammatory properties.

Numerous clinical trials have been conducted to demonstrate the anti-inflammatory efficacy of curcumin. Their findings indicate that curcumin may effectively alleviate inflammation associated with rheumatoid arthritis (RA) and decrease RA symptoms, including joint swelling and morning stiffness, when compared to phenylbutazone, utilized as a positive control. Additionally, curcumin was evaluated in patients with anterior uveitis, and after two weeks,

complete remission was observed. Another clinical trial demonstrated the effectiveness of curcumin in patients with dyspepsia and/or gastric ulcer. In this study, participants achieved remission within a maximum of 12 weeks. Curcumin is beneficial in treating irritable bowel syndrome (IBS) and serves as a reducing agent in mitigating delayed graft rejection (DGR) following kidney transplant surgery. Moreover, curcumin demonstrates a positive effect in inhibiting inflammatory bowel disease (IBD) and reducing sedimentation rates in patients afflicted with IBD. Additionally, it has been shown to aid in the maintenance of ameliorating ulcerative colitis and psoriasis through the selective inhibition of phosphorilase kinase.

The taxonomy of *Curcuma longa* is as follows:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Monocots
- Order: Zingiberales
- Family: Zingiberaceae
- Genus: *Curcuma*
- Species: *C. longa*

Biological source of *Curcuma longa*:

The biological source of *Curcuma longa* is the rhizomes, which are underground stems or roots of the plant. These rhizomes are the part of the plant that is typically harvested for culinary, medicinal, and industrial purposes.

Chemical constituents of *Curcuma longa*:

Curcuma longa contains various chemical constituents, with curcumin being the most well-known and studied. Other important constituents include:

1. Curcuminoids: Apart from curcumin, there are two other curcuminoids present in turmeric: demethoxycurcumin and bisdemethoxycurcumin.
2. Essential oils: Turmeric contains volatile oils such as turmerone, atlantone, and zingiberene.
3. Proteins: Several proteins have been identified in turmeric, including turmerin, which is specific to *Curcuma* species.
4. Carbohydrates: Turmeric contains starch, fiber, and other carbohydrates.
5. Vitamins and minerals: Turmeric contains vitamins such as vitamin C and minerals like calcium, iron, and potassium.
6. Other compounds: Turmeric also contains compounds like resins, gums, and pigments, which contribute to its color and properties.

These constituents contribute to the various biological activities and health benefits associated with turmeric.

Geographical source of *Curcuma longa*:

Curcuma longa, commonly known as turmeric, is native to the Indian subcontinent and Southeast Asia. It is primarily cultivated in countries such as India, Indonesia, China, Thailand, and Vietnam. The tropical and subtropical climates of these regions provide optimal conditions for the growth of turmeric.

2) *Zingiber officinale*:-



Zingiber officinale, known as ginger in English, زنجبیل in Persian, अदरक in Hindi, and الزنجبیل in Arabic, originates from Southeast Asia. The oral intake of *Z. officinale* extract has demonstrated varied and inconsistent effects, contingent upon the dosage consumed. While the administration of freshly squeezed ginger extract to mice once or twice has increased tumor necrosis factor-alpha (TNF- α) in peritoneal cells, prolonged consumption of the extract has

led to elevated serum corticosterone levels and reduced proinflammatory markers. In a study involving type 2 diabetic patients with low-grade inflammation, treatment with *Z. officinale* extract for two months resulted in a definite decrease in serum levels of TNF- α and high-sensitivity C-reactive protein (hs-CRP). Furthermore, in patients with osteoarthritis, ginger exhibited not only comparable efficacy in pain relief to Diclofenac 100 mg but also demonstrated no adverse effects. When compared to Ibuprofen and Indomethacin in osteoarthritis patients, ginger extract showed equal improvement in pain scores. Ginger powder has shown therapeutic effects in musculoskeletal and rheumatism patients by inhibiting the cyclooxygenase and lipoxygenase pathways in synovial fluid.

The taxonomy of *Zingiber officinale* is as follows:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Monocots
- Order: Zingiberales
- Family: Zingiberaceae
- Genus: *Zingiber*
- Species: *Z. officinale*

The biological source of *Zingiber officinale*:

The biological source of *Zingiber officinale*, commonly known as ginger, is the rhizome, which is an underground stem or root of the plant. The rhizome is the part of the plant that is typically harvested for culinary, medicinal, and industrial purposes.

The chemical constituents of *Zingiber officinale* (ginger) include:

1. Gingerols: These are the primary bioactive compounds responsible for ginger's characteristic flavor and aroma. They also possess anti-inflammatory and antioxidant properties.
2. Shogaols: These compounds are formed from gingerols during the drying or cooking process. They also exhibit anti-inflammatory and antioxidant effects.
3. Zingerone: This compound contributes to ginger's spicy flavor and has antioxidant properties.
4. Gingerdiol: A minor constituent with potential biological activity.
5. Volatile oils: Ginger contains various volatile oils such as zingiberene, α -curcumene, and β -bisabolene, which contribute to its aroma and medicinal properties.
6. Phenolic compounds: Ginger contains phenolic compounds such as flavonoids and phenolic acids, which contribute to its antioxidant activity.
7. Terpenes: Ginger contains terpenes like β -sitosterol and camphene, which may have various health benefits.

These chemical constituents contribute to the diverse biological activities and health benefits associated with ginger.

Geographical source of *Zingiber officinale*:

Zingiber officinale, commonly known as ginger, is believed to have originated from Southeast Asia, particularly from regions such as India, China, and Indonesia. It is now cultivated in tropical and subtropical regions worldwide, including Africa, the Caribbean, and Latin America. The plant thrives in warm and humid climates with well-drained soil.

3) *Rosmarinus officinalis*:-



Rosmarinus officinalis, commonly known as Rosemary in English, رزماری in Persian, Romero in Spanish, गुलमेंहदी in Hindi, and روزماری in Arabic, originates from the Mediterranean area.

In an open-label trial spanning four weeks, the effects of rosemary extract were evaluated in patients with osteoarthritis (OA), rheumatoid arthritis (RA), and fibromyalgia. Noticeable reductions in hs-CRP levels, an inflammation index, were observed in patients who initially showed elevated levels. While a decrease in inflammation-associated pain scores was noted during the treatment, complete remission did not occur in fibromyalgia scores. Evidence suggests the anti-inflammatory potential of *R. officinalis* at a molecular level. Rosmarinic acid has been shown to disrupt the activation of the complement system by inhibiting C3b attachment, with a very low dose (34 μ M) required for this effect. Moreover, rosemary extract has demonstrated gastroprotective action against gastric ulcers, outperforming Omeprazole. This advantage stems from rosemary's inhibition of neutrophil infiltration and reduction in proinflammatory mediators such as TNF- α and IL-1. However, a preclinical study on rats revealed that high doses of rosemary extract (500 mg/kg) reduced testosterone levels and spermatogenesis, leading to infertility. Rosemary has also exhibited topical anti-inflammatory effects in wound healing in mice. Carnosic acid in *R. officinalis* interacts with CYP3A4 and CYP2B6 substrates and has shown toxicity in human hepatocytes, with an EC50 value similar to Tamoxifen.

The taxonomy of *Rosmarinus officinalis* is as follows:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Eudicots
- Order: Lamiales
- Family: Lamiaceae
- Genus: *Rosmarinus*
- Species: *R. officinalis*

The biological source of *Rosmarinus officinalis*:

The biological source of *Rosmarinus officinalis*, commonly known as rosemary, is the leaves and flowering tops of the plant. These parts of the plant are harvested and used for various culinary, medicinal, and aromatic purposes

The chemical constituents of *Rosmarinus officinalis* (rosemary) include:

1. Essential oils: Rosemary contains various essential oils, with the main components being camphor, 1,8-cineole (eucalyptol), α -pinene, and β -pinene. These oils contribute to rosemary's characteristic aroma and medicinal properties.
2. Phenolic compounds: Rosemary is rich in phenolic compounds such as rosmarinic acid, carnosic acid, and carnosol. These compounds possess antioxidant, anti-inflammatory, and antimicrobial properties.
3. Flavonoids: Rosemary contains flavonoids such as diosmetin, apigenin, and luteolin, which also exhibit antioxidant and anti-inflammatory effects.
4. Terpenoids: Rosemary contains terpenoids like ursolic acid and oleanolic acid, which have been associated with various health benefits, including anti-inflammatory and anticancer effects.
5. Rosmarinyl diterpenes: These compounds, including rosmadial and rosmaridiphenol, contribute to the biological activities of rosemary, such as antioxidant and antimicrobial properties.
6. Triterpenes: Rosemary contains triterpenes like betulinic acid and ursolic acid, which have been studied for their potential anticancer and anti-inflammatory effects.

These chemical constituents collectively contribute to the diverse pharmacological activities and health benefits associated with rosemary.

Geographical source of *Rosmarinus officinalis*:

Rosmarinus officinalis, commonly known as rosemary, is native to the Mediterranean region, including countries such as Spain, Italy, Greece, and France. It thrives in sunny, dry climates with well-drained soil. Additionally, rosemary is cultivated in various parts of the world with similar climatic conditions, including regions in North America, Africa, and Australia.

4) *Boswellia serrata*:-



Boswellia serrata, commonly known as Indian Olibanum in English, کندر in Persian, शल्लकी in Hindi, and اللبان in Arabic, is an oleo-gum resin obtained from the *Boswellia* tree, native to India.

The effectiveness of *Boswellia serrata* extract in patients with osteoarthritis has been well-documented. Significant improvements in joint swelling, pain frequency, joint flexibility, and walking distance have been noted at the conclusion of the treatment period. Similarly, a notable reduction in erythrocyte sedimentation rate (ESR), morning stiffness, and the need for nonsteroidal anti-inflammatory drugs (NSAIDs) during therapy has been observed in patients with rheumatoid arthritis in another clinical trial. However, in one pilot study involving patients with chronic polyarthritis, no significant remission in patient symptoms was observed after 12 weeks of therapy with *Boswellia serrata* extract, although a minor reduction in NSAID requirement was noted. Collagenous colitis, an inflammatory bowel disease (IBD), has shown clinical improvement with *Boswellia serrata* therapy compared to placebo in targeted therapy groups. Furthermore, a combination of *Boswellia serrata* with *Curcuma longa* and *Glycyrrhiza glabra* has been effective in improving symptoms in asthmatic patients. In this study, the treatment group demonstrated a significant decrease in plasma levels of leukotriene C4 (LTC₄), nitric oxide (NO), and malondialdehyde after 4 weeks. *Boswellia serrata* extract has been shown to modulate inflammatory mediators such as TNF- α , IL-1 β , IL-6, IFN- γ , and PGE₂ in both in vivo and in vitro studies. Boswellic acid, the main component of this resin, can inhibit C3 convertase and suppress the classic pathway of the complement system, exhibiting both topical anti-inflammatory effects and systemic effects.

The taxonomy of *Boswellia serrata* is as follows:

- Kingdom: Plantae
- Phylum: Angiosperms
- Class: Eudicots
- Order: Sapindales
- Family: Burseraceae
- Genus: *Boswellia*
- Species: *B. serrata*

Biological source of *Boswellia serrata*:

The biological source of *Boswellia serrata* is the *Boswellia* tree, specifically its oleo-gum resin. This resin is obtained from the bark of the *Boswellia serrata* tree and is the part of the plant that is harvested for medicinal use.

The chemical constituents of *Boswellia serrata* include:

1. Boswellic acids: These are the primary bioactive compounds found in *Boswellia serrata* resin. They include α -boswellic acid, β -boswellic acid, 11-keto- β -boswellic acid, and acetyl-11-keto- β -boswellic acid (AKBA). Boswellic acids possess anti-inflammatory and anti-arthritic properties.
2. Pentacyclic triterpenes: These compounds are found in the resin and contribute to its medicinal properties.
3. Essential oils: *Boswellia serrata* resin also contains essential oils, which contribute to its aroma and potential therapeutic effects.
4. Polysaccharides: These complex carbohydrates are present in the resin and may have immune-modulating properties.

5. Phospholipids: Boswellia serrata resin contains phospholipids, which may contribute to its biological activities.

6. Triterpenoids: Various triterpenoid compounds have been identified in Boswellia serrata resin, some of which may have medicinal properties.

These chemical constituents work synergistically to produce the medicinal effects associated with Boswellia serrata, including anti-inflammatory, analgesic, and immunomodulatory properties.

Geographical source of Boswellia serrata:

Boswellia serrata is primarily found in the dry, hilly regions of India, particularly in the states of Madhya Pradesh, Rajasthan, and Maharashtra. It is also native to other countries in the Indian subcontinent, including Pakistan and Bangladesh. Additionally, Boswellia serrata grows in parts of Africa, particularly in Somalia and Ethiopia.

3. CONCLUSION

Natural herbs are safer and more effective than synthetic drugs for reducing inflammation. Their components work similarly to synthetic molecules. Future research should look into how these herbs can be used to treat various diseases. Recent patents on anti-inflammatory drugs and herbs offer insights into the present and future of this field.

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