

Exploring Herbal Treatment: A Comparative Review of Their Efficacy in Rheumatic Arthritis

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Abstract

Rheumatoid arthritis (RA) is a chronic inflammatory disease that mostly affects the joints but can potentially have systemic consequences across various organs. Traditional treatments, such as Disease-Modifying Antirheumatic Drugs (DMARDs) and Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) provide symptom relief but may cause side effects with varying severity long-term use. Recent interest has emerged in herbal plants with anti-inflammatory properties, which have been used historically in Ayurvedic and Unani medicine. This review highlights the potential of various medicinal plants, including ginger, turmeric, guggul, green tea, eucalyptus, mango, black pepper, and licorice, to manage RA symptoms by reducing inflammation, alleviating joint pain, and improving patient quality of life. These plants contain bioactive compounds with significant anti-inflammatory, antioxidant, and pain-relieving properties. Further scientific evaluation is essential to validate their efficacy and safety, aiming to integrate traditional remedies with modern medicine for holistic RA treatment.

Keywords: Rheumatoid arthritis, herbal therapy, anti-inflammatory, joint pain, autoimmune disease

INTRODUCTION

Rheumatoid arthritis (RA) is a joint disorder caused by an autoimmune response that leads to chronic inflammation, impacting various parts of the body. While it primarily targets the joints, RA can also have widespread effects on multiple organs, including the heart, kidneys, salivary glands, bone marrow, lungs, blood vessels, nerve tissue, and skin. This condition can significantly influence the health and overall quality of life of those affected [1].

Epidemiological data indicate that around 1% of the global population suffers from RA, amounting to approximately 700 million individuals, with over 80% of them being women. RA is characterized by inflammation in small to medium-sized joints, but it also features systemic inflammation. Various autoimmune and inflammatory mechanisms can be involved, making the disease complex and diverse in its clinical presentation. Certain herbs, such as thyme, cinnamon, and ashwagandha, possess anti-inflammatory properties that may help alleviate joint pain associated with RA [2].

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Received Date: December 14, 2024

Accepted Date: January 03, 2025

Published Date: January 07, 2025

Citation: Mohd. Wasiullah, Piyush Yadav, Abhinav Pandey. Exploring Herbal Treatment: A Comparative Review of Their Efficacy in Rheumatic Arthritis. Research & Reviews: Journal of Herbal Science. 2025; 14(2): 13–21p.

Additionally, some researchers are investigating stem cell therapy as a potential new treatment option for rheumatoid arthritis, which could lead to innovative approaches for managing this. It looks like you are drafting content on rheumatoid arthritis, covering its pathogenesis, symptoms, and risk factors. Here is a revised version for clarity and flow:

Pathogenesis

Rheumatoid arthritis (RA) is a chronic autoimmune disease that mostly affects the joints. It is distinguished by the inflammation of the synovial membrane, which causes joint discomfort,

edema, stiffness, and, ultimately, joint destruction. Although the specific etiology of RA is unknown, it is thought to occur from a mix of genetic and environmental factors.

Symptoms

Rheumatoid arthritis commonly presents symptoms, such as joint pain, prolonged morning stiffness, involvement of multiple and often symmetrical joints (starting with smaller ones like those in the hands and feet), joint swelling and tenderness, chronic stiffness lasting over six weeks, fatigue, unintended weight loss, low-grade fever, and sensations of numbness or tinglings in the extremities.

RISK FACTORS

Several Risk Factors

Genetic factors

- *Family History*: Having a family member with RA raises the risk of having the ailment.
- *HLA-DR4 and HLA-DR1 Genes*: These genetic markers in the human leukocyte antigen (HLA) system are closely linked to RA risk.
- *Other genetic polymorphisms*: Variants in genes associated with immune control (e.g., PTPN22, STAT4) can increase the risk.

Environmental Factors

Smoking is one of the most major environmental risk factors. It not only raises the risk of having RA, but it also exacerbates the disease's severity [3].

- *Air Pollution*: Exposure to environmental contaminants may cause systemic inflammation and autoimmune responses.
- *Occupational Exposures*: Jobs that require silica exposure (e.g., mining, construction) are related to an increased risk of RA.

Lifestyle Factors

- *Obesity*: Being overweight is associated with increased inflammation, which may contribute to the development and progression of RA.
- *Diet*: A diet high in processed foods and lacking in anti-inflammatory elements (such as omega-3 fatty acids) may increase the chance of developing RA.
- *Physical inactivity*: A lack of regular exercise might worsen systemic inflammation.

Biological and Demographic Factors

Rheumatoid arthritis can develop at any age, but it is most common between 30 and 60.

- *Sex*: Women are 2–3 times more likely than men to get RA, likely due to hormonal variations.
- *Hormonal Changes*: Pregnancy, menopause, and the use of hormonal contraception all raise the risk of getting RA [4].

Autoimmune and Immune-Related Factors

- *Autoantibodies*: The presence of antibodies, such as rheumatoid factor (RF) and anti-cyclic citrullinated peptide (anti-CCP) indicates a higher risk of developing RA.
- *Systemic inflammation*: Chronic low-grade inflammation can predispose people to autoimmune diseases [5].

ANTI-RHEUMATIC HERBAL PLANT

Various herbal plants are utilized as alternative treatments for managing rheumatoid arthritis (Figure 1) [6]. Some commonly used herbal plants include:

ZINGIBER OFFICINALE (GINGER)

Family – Zingiberaceae

- *Biological Source*: The biological source of “*Zingiber officinale*” (Figure 2) is the plant itself, commonly known as ginger. Ginger is a flowering plant whose rhizome, or underground stem, is widely used as a spice [7].

- **Chemical Constituents:** gingerols, gingerone, flavonoids, etc. Ginger, originating from Southeast Asia, is valued as both a spice and medicinal herb. Studies show it contains sesquiterpenes, monoterpenes, and other essential oils with anti-inflammatory, antioxidant, antimicrobial, and antifungal properties. Ginger is particularly noted for its effectiveness in alleviating symptoms like nausea, joint pain from arthritis, and inflammation. It inhibits molecules responsible for pain and swelling, including leukotrienes and prostaglandins [7].
- **Moa:** By regulating the activity of T-cells and macrophages, ginger may decrease the autoimmune attack on joint tissues, contributing to reduced joint inflammation and tissue damage [8].

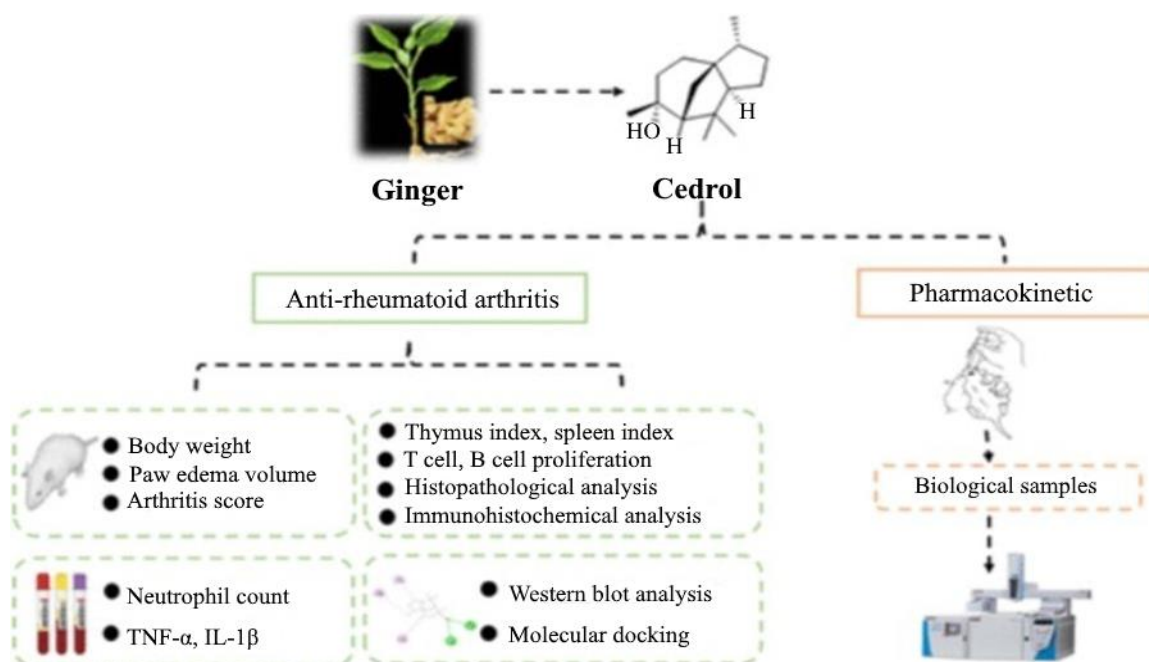


Figure 1. *Zingiber officinale* plants are utilized as alternative treatments for managing rheumatoid arthritis.

***CURCUMA LONGA* (TURMERIC)**

Family – Zingiberaceae

- **Biological Source:** The biological source of curcumin is the plant “*Curcuma Longa*” (Figure 3) commonly known as turmeric. Curcumin is a naturally occurring polyphenolic compound found in the rhizomes (underground stems) of turmeric.



Figure 2. *Zingiber officinale*.

- **Chemical Constituents:** curcuminoids, curcumin, turmerone, etc. *Curcuma longa*, also known as turmeric, is a plant high in curcumin, the primary bioactive ingredient responsible for the yellow color and health benefits. Curcumin's anti-inflammatory and antioxidant properties make it an effective treatment for arthritis. It inhibits inflammatory mediators and chemicals that cause joint damage, including TNF- α and COX-2, making it a potential natural treatment for arthritis [9].
- **Moa:** Curcumin influences immune cell function, particularly T and B lymphocytes. It has been shown to modulate the balance between T-helper cell subsets, potentially reducing the autoimmune response that drives RA.

This immunomodulatory impact helps to reduce the hyperactive immune response without creating universal immunosuppression.



Figure 3. *Curcuma Longa* (Turmeric).

COMMIPHORA MUKUL (GUGGUL)

Family – Burseraceae

- **Biological Source:** The biological source of “*Commiphora Mukul*” (Figure 4) is the resin, commonly referred as guggul. The resin was extracted from the bark of the tree.
- **Chemical Constituents:** Guggulsterones, mukulol, resin, etc. The resin from *Commiphora mukul*, known as guggul, is widely used in Ayurveda. The guggulsterones within guggul have been studied for their anti-inflammatory and anti-arthritis effects. Guggul effectively reduces symptoms of RA, including joint swelling and inflammatory markers, while recent studies highlight its potential in creating bioactive nanoparticles for targeted RA for the treatment [10].
- **Moa:** Guggulsterones, the primary active compounds in guggul, can inhibit the production of pro-inflammatory cytokines, such as TNF- α (tumor necrosis factor-alpha) and IL-1 β (interleukin-1 beta). These cytokines play a major role in inflammation and joint damage in RA. By reducing these cytokines, *Commiphora Mukul* may help decrease inflammation and alleviate symptoms associated with rheumatoid arthritis.



Figure 4. *Commiphora Mukul*.

CAMELLIA SINESIS (GREENTEA)

Family – Theaceae

- *Biological Source:* The biological source of “*Camellia Sinesis*” (Figure 5) is the plant itself, commonly known as the tea plant. the primary source for all types of tea, including green, black, white, tea’s. The leaves and leaf buds of “*Camellia sinensis*” are harvested and processed in various ways to produce different types of tea, each containing active compounds [11].
- *Chemical Constituents:* polyphenols, catechins, theanine, etc. Green tea, derived from *Camellia sinensis*, is rich in polyphenols, like catechins, including EGCG, which exhibit antioxidant and anti-inflammatory properties. Green tea’s components have been shown to suppress pro-inflammatory pathways, including IL-1 signaling, COX-2, and certain cytokines, making it beneficial in managing RA symptoms [12].
- *Moa:* epigallocatechin-3-gallate (EGCG) inhibits the nuclear factor kappa B (NF-κB) signaling pathway, which is critical in regulating immune responses, inflammation, and cytokine production in RA. Blocking NF-κB can prevent the expression of genes responsible for chronic inflammation in the joints.



Figure 5. *Camellia Sinesis*.

EUCALYPTUS

Family – Myrtaceae

- *Biological Source:* The biological source of eucalyptus is the plant genus “*Eucalyptus*” (Figure 6), which includes various species, most notably “*Eucalyptus globulus*”, commonly known as the blue gum tree. The leaves of the eucalyptus tree are rich in essential oils.
- *Chemical Constituents:* Limonene, tannins, phenolic acid, etc. Known for its essential oils, eucalyptus is used worldwide for pain relief. Eucalyptus oil, often inhaled, is effective for reducing pain by triggering the release of endorphins. It is especially useful for knee pain, and eucalyptus-based gels exhibit anti-inflammatory properties, inhibiting joint cell proliferation, which may benefit RA patients [13, 14].
- *Moa:* Eucalyptol inhibits pro-inflammatory cytokines (such as TNF-α, IL-1β, and IL-6) that play a key role in the inflammatory process of RA. By reducing these cytokines, eucalyptus oil can help lessen joint swelling and pain associated with RA.



Figure 6. *Eucalyptus*.

MANGIFERA INDICA (MANGO)

Family – Anacardiaceae

- **Biological Source:** The biological source of “*Mangifera indica*” (Figure 7) is the plant itself, commonly known as the mango tree. The fruit, bark, leaves, and seeds of the mango tree are all utilized for their nutritional and medicinal properties [15].
- **Chemical Constituents:** mangiferin, catechins, quercetin, etc. The aqueous extract of mango (Vimang) has been used in Cuban medicine as an anti-inflammatory and antioxidant. Studies indicate that mango extract can reduce RA activity, notably reducing inflammatory markers and pain in conjunction with conventional treatments like Methotrexate (MTX) [16].
- **Moa:** *Mangifera indica* contains potent antioxidants like mangiferin and quercetin. In RA, oxidative stress exacerbates joint damage, so the antioxidant properties help neutralize free radicals, potentially slowing down the progression of joint damage and inflammation. This antioxidant action helps protect the synovial membrane and cartilage from oxidative damage, which is key in managing RA symptoms [17].

PIPER NIGRUM

Family Piperaceae

- **Biological Source:** The biological source of “*Piper nigrum*” (Figure 8) is the plant itself, commonly known as black pepper. The plant is a climbing vine, and the part used is the fruit, which is harvested when immature and then dried to produce black peppercorns.
- **Chemical Constituents:** piperine, piperidine, piperettine, etc. Black contains pepper piperine, an alkaloid with bioavailability-enhancing properties. Piperine reduces the production of inflammatory molecules, such as interleukin-6 and PGE2, showing promise in arthritis treatment. It also has been found to ease pain and inflammation in animal models of arthritis [18].
- **Moa:** Piperine inhibits cyclooxygenase (COX) and lipoxygenase (LOX) enzymes, which are involved in the synthesis of inflammatory mediators like prostaglandins and leukotrienes. This reduces inflammation in the joints and surrounding tissues.



Figure 7. *Mangifera indica*.



Figure 8. *Piper nigrum*.

GLYCYRRHIZA GLABRA (LIQORICE)

Family – Fabaceae

- *Biological Source:* The biological source of “*Glycyrrhiza glabra*” (Figure 9) is the plant itself, commonly known as licorice. “*Glycyrrhiza glabra*” belongs to the legume family. The root of the plant is primarily used for its medicinal properties and flavoring. Licorice root contains various active compounds [19].
- *Chemical Constituents:* glycyrrhizin, glabridin, etc. Licorice root contains glycyrrhizin, a compound with anti-allergic and anti-inflammatory properties. It suppresses pathways responsible for inflammation, including COX-2, PGE2, and several cytokines, and has shown it to be effective in reducing symptoms in arthritis models, particularly by decreasing inflammatory mediators and joint damage markers.
- *Moa:* Licorice may suppress the action of enzymes involved in the inflammatory process, including cyclooxygenase (COX). By suppressing COX, licorice can help reduce the manufacture of prostaglandins, which are chemicals that cause inflammation and pain [20].



Figure 9. *Glycyrrhiza glabra*.

CONCLUSIONS

Herbal therapy is a widely adopted alternative treatment for rheumatoid arthritis, given that herbal plants are a primary source of effective medicinal compounds. Rheumatoid arthritis, characterized by joint swelling and varying from mild pain to severe joint deformity, is traditionally treated with synthetic drugs like DMARDs and NSAIDs. However, these treatments may come with adverse side effects that limit their long-term effectiveness. Thus, Ayurvedic and Unani medicinal plants, known for their anti-arthritic properties, present a promising alternative. These plants need further scientific evaluation to establish safer treatment options that minimize avoidable side effects.

This review has provided an academic perspective on the potential of medicinal herbs as an effective therapy for rheumatoid arthritis. Further research into these natural remedies may offer patients a holistic and safer approach to managing chronic conditions, underscoring the importance of integrating traditional knowledge with modern scientific analysis.

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