



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Paper

Comprehensive Review: - Therapeutic Potential of *Nyctanthes arbor-tristis* and *Calotropis gigantea* in Rheumatoid Arthritis

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ARTICLE INFO

Published: 22 May 2026

Keywords:

Rheumatoid arthritis
,*Nyctanthes arbor-tristis*
,*Calotropis gigantea* ,Anti-inflammatoryactivity,Phytochemicals,Herbalmedicine,Immunomodulatory activity
,Anti-arthritic activity

DOI:

10.5281/zenodo.20342021

ABSTRACT

Rheumatoid Arthritis is a chronic autoimmune disorder characterized by persistent synovial inflammation, cartilage destruction, joint deformity, pain, and reduced quality of life. Conventional therapies including nonsteroidal anti-inflammatory drugs, corticosteroids, and disease-modifying antirheumatic drugs provide symptomatic relief but are often associated with significant adverse effects during long-term use. Therefore, increasing attention has been directed toward herbal medicines possessing anti-inflammatory, antioxidant, and immunomodulatory properties for safer and effective management of rheumatoid arthritis. *Nyctanthes arbor-tristis* and *Calotropis gigantea* are important medicinal plants widely used in traditional systems of medicine for the treatment of inflammatory disorders. This review comprehensively evaluates their phytochemical composition, pharmacological activities, and therapeutic potential in rheumatoid arthritis. Various bioactive constituents including flavonoids, alkaloids, glycosides, iridoids, tannins, terpenoids, phenolic compounds, and cardiac glycosides have been reported from these plants and are responsible for significant anti-inflammatory and anti-arthritic effects. Experimental studies demonstrate that these plants inhibit pro-inflammatory cytokines, reduce oxidative stress, suppress inflammatory mediators, and protect against cartilage and joint damage. Additionally, both plants exhibit analgesic and immunomodulatory activities that may contribute to improved management of rheumatoid arthritis symptoms. The findings of the present review suggest that *Nyctanthes arbor-tristis* and *Calotropis gigantea* possess promising therapeutic potential as alternative or complementary agents in rheumatoid arthritis treatment. However, further clinical studies, toxicity evaluations, and standardization of herbal formulations are required to establish their safety, efficacy, and future pharmaceutical applications in rheumatoid arthritis management demonstrate that these herbal eye patches indicate a safe, effective, and affordable method that promotes the use of natural products for skin care therapy. [6,7,26]

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



INTRODUCTION

Rheumatoid Arthritis (RA) is a chronic, progressive, and systemic autoimmune disorder primarily affecting synovial joints and leading to inflammation, pain, stiffness, swelling, and gradual destruction of cartilage and bone. The disease commonly affects small joints of the hands and feet and may eventually result in severe joint deformity, functional disability, and decreased quality of life. Rheumatoid arthritis affects millions of people worldwide and is more prevalent among women than men. The exact etiology of RA remains unclear; however, genetic susceptibility, environmental factors, hormonal imbalance, and immune dysregulation are considered major contributors to disease development.

The pathogenesis of rheumatoid arthritis involves activation of immune cells such as T lymphocytes, B lymphocytes, macrophages, and synovial fibroblasts, leading to excessive production of pro-inflammatory cytokines including tumour necrosis factor-alpha (TNF- α), interleukin-1 β (IL-1 β), and interleukin-6 (IL-6). These inflammatory mediators promote synovial hyperplasia, oxidative stress, cartilage degradation, and bone erosion. Persistent inflammation further contributes to systemic complications including cardiovascular disorders, osteoporosis, and muscle wasting. Oxidative stress generated by reactive oxygen species also plays a significant role in the progression of rheumatoid arthritis by damaging cellular proteins, lipids, and DNA.

Conventional treatment strategies for rheumatoid arthritis mainly include nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, disease-modifying antirheumatic drugs (DMARDs), and biological agents. Although these therapies provide symptomatic relief and slow disease progression, prolonged use is often associated with serious adverse effects such as

gastrointestinal ulceration, hepatotoxicity, nephrotoxicity, immunosuppression, hypertension, and increased susceptibility to infections. In addition, high treatment costs and incomplete therapeutic responses have encouraged researchers to explore safer and more effective alternative therapies derived from natural sources. Medicinal plants have been extensively utilized in traditional systems of medicine due to their diverse pharmacological activities and comparatively lower side effects. Herbal medicines contain numerous bioactive phytoconstituents such as flavonoids, alkaloids, terpenoids, glycosides, phenolic compounds, and tannins that exhibit anti-inflammatory, antioxidant, analgesic, and immunomodulatory properties. These multi-target actions make medicinal plants promising therapeutic candidates for the management of chronic inflammatory diseases including rheumatoid arthritis.

Among various medicinal plants, *Nyctanthes arbor-tristis* and *Calotropis gigantea* have gained considerable attention because of their significant medicinal value and traditional use in inflammatory and painful disorders. *Nyctanthes arbor-tristis*, commonly known as night-flowering jasmine or Parijat, belongs to the family Oleaceae and is widely distributed in India and Southeast Asian countries. Different parts of the plant, including leaves, flowers, bark, and seeds, possess important phytochemicals such as flavonoids, iridoid glycosides, tannins, and phenolic compounds that contribute to anti-inflammatory, antioxidant, analgesic, antipyretic, and immunomodulatory activities. Experimental studies have demonstrated its ability to inhibit inflammatory mediators and reduce oxidative stress associated with arthritic conditions.

Plant Profile –

Nyctanthes arbor-tristis



Nyctanthes arbor-tristis commonly known as Night Jasmine or Parijat, belongs to the family Oleaceae. It is a small ornamental tree widely distributed in India and South Asian countries. The plant possesses fragrant white flowers with orange tubular centres and rough dark green leaves. Different parts of the plant such as leaves, flowers, bark, and seeds are traditionally used in Ayurveda for the treatment of fever, arthritis, inflammation, skin diseases, and rheumatism. Phytochemical studies reveal the presence of flavonoids, glycosides, alkaloids, tannins, terpenoids, and iridoid glycosides which contribute to its medicinal properties. The plant is reported to exhibit anti-inflammatory, analgesic, antioxidant, immunomodulatory, and anti-arthritic activities, making it a promising herbal candidate for the management of Rheumatoid Arthritis.

Calotropis gigantea

Calotropis gigantea, commonly known as Giant Milkweed or Crown Flower, belongs to the family Apocynaceae. It is a perennial shrub commonly found in tropical and subtropical regions of India. The plant is characterized by large thick leaves, milky latex, and purple or white flowers. Traditionally, various parts of the plant including leaves, roots, flowers, and latex are used in folk medicine for the treatment of pain, inflammation, asthma, skin disorders, and rheumatism. The plant contains several bioactive constituents such as flavonoids, cardiac glycosides, triterpenoids, alkaloids, and phenolic compounds. Pharmacological studies have demonstrated significant anti-inflammatory, analgesic, antioxidant, antimicrobial, and anti-arthritic activities. Due to these therapeutic properties, *Calotropis gigantea* has gained attention as a potential herbal medicine for Rheumatoid Arthritis management.

Methodology of Literature Review

The present review was conducted through a comprehensive analysis of published scientific literature related to the therapeutic potential of *Nyctanthes arbor-tristis* and *Calotropis gigantea* in the management of Rheumatoid Arthritis. Relevant research articles, review papers, pharmacological studies, and ethnomedicinal reports were collected from various electronic databases including PubMed, Google Scholar, Scopus, ScienceDirect, and ResearchGate.

A systematic search strategy was employed using keywords such as “Rheumatoid arthritis,” “*Nyctanthes arbor-tristis*,” “*Calotropis gigantea*,” “anti-inflammatory activity,” “anti-arthritic activity,” “medicinal plants,” “phytochemicals,” “immunomodulatory activity,” and “herbal therapy.” Boolean operators such as AND and OR were applied to improve the accuracy and relevance of the search results.

The literature included studies published primarily between 2000 and 2026 to ensure updated scientific information. Both in vitro and in vivo experimental studies, phytochemical investigations, and pharmacological evaluations related to anti-inflammatory, antioxidant, analgesic, and immunomodulatory activities were considered for inclusion in this review. Articles written in English and containing sufficient scientific data regarding the therapeutic effects of the selected medicinal plants were included.

Studies lacking adequate experimental evidence, duplicate publications, non-peer-reviewed articles, and unrelated studies were excluded from the review. The collected data were critically analyzed and organized under different sections including phytochemical constituents, pharmacological activities, mechanisms of action, anti-arthritic potential, and future therapeutic prospects. This methodological approach helped provide a comprehensive understanding of the role of *Nyctanthes arbor-tristis* and *Calotropis gigantea* in rheumatoid arthritis management.



Mechanism of Rheumatoid Arthritis Management by Herbal Plants

Herbal plants play a significant role in the management of Rheumatoid Arthritis through multiple pharmacological mechanisms including anti-inflammatory, antioxidant, analgesic, and immunomodulatory actions. Medicinal plants contain diverse bioactive phytoconstituents such as flavonoids, alkaloids, glycosides, terpenoids, tannins, saponins, and phenolic compounds that target various pathways involved in the pathogenesis of rheumatoid arthritis. These phytochemicals help reduce inflammation, suppress oxidative stress, regulate immune responses, and protect joints from progressive damage.

1. Anti-inflammatory Mechanism

Chronic inflammation is the major pathological feature of rheumatoid arthritis. Herbal plants exert anti-inflammatory effects by inhibiting the synthesis and release of pro-inflammatory mediators such as tumor necrosis factor- α (TNF- α), interleukin-1 β (IL-1 β), interleukin-6 (IL-6), prostaglandins, and cyclooxygenase (COX) enzymes. Reduction of these inflammatory cytokines decreases synovial inflammation, pain, redness, and swelling in affected joints. Many phytochemicals also inhibit the nuclear factor-kappa B (NF- κ B) signaling pathway, which plays an important role in inflammatory responses and progression of rheumatoid arthritis.

2. Antioxidant Mechanism

Oxidative stress contributes significantly to cartilage destruction and tissue injury in rheumatoid arthritis. Reactive oxygen species (ROS) generated during chronic inflammation damage proteins, lipids, and cellular DNA. Herbal plants rich in flavonoids, phenolic compounds, and tannins exhibit strong antioxidant properties by scavenging free radicals and reducing oxidative

stress. These antioxidant compounds enhance endogenous antioxidant enzymes such as superoxide dismutase, catalase, and glutathione peroxidase, thereby protecting synovial tissues and preventing further joint damage.

3. Immunomodulatory Mechanism

Rheumatoid arthritis is an autoimmune disorder involving abnormal activation of immune cells including T cells, B cells, macrophages, and synovial fibroblasts. Herbal medicines help regulate immune responses by suppressing excessive immune cell activation and reducing the production of autoantibodies and inflammatory cytokines. Certain phytochemicals modulate immune signaling pathways and maintain immune balance, thereby minimizing autoimmune reactions and slowing disease progression. Immunomodulatory activity also helps decrease chronic synovial inflammation and tissue destruction associated with rheumatoid arthritis.

4. Analgesic Mechanism

Pain is one of the major symptoms experienced by rheumatoid arthritis patients. Several medicinal plants possess natural analgesic properties that help reduce pain by inhibiting inflammatory mediators and blocking pain signaling pathways. Herbal compounds may reduce prostaglandin synthesis and suppress nociceptive responses, thereby providing symptomatic relief from joint pain and stiffness without causing severe adverse effects commonly associated with synthetic analgesics.

5. Inhibition of Cartilage and Bone Destruction

Progressive degradation of cartilage and erosion of bone are characteristic features of rheumatoid arthritis. Herbal phytoconstituents may inhibit matrix metalloproteinases (MMPs) and other degradative enzymes responsible for cartilage breakdown. Additionally, some medicinal plants reduce osteoclast activity and bone resorption,



thereby protecting joint integrity and preventing deformities. These protective effects contribute to improved joint function and mobility.

6. Regulation of Cytokine and Enzyme Activity

Medicinal plants regulate several inflammatory enzymes and signaling molecules involved in rheumatoid arthritis progression. Phytochemicals suppress lipoxygenase (LOX), cyclooxygenase (COX), nitric oxide synthase (iNOS), and other inflammatory enzymes responsible for the production of inflammatory mediators. This regulation helps reduce edema, tissue injury, and inflammatory cell infiltration within synovial joints.

7. Synergistic Multi-target Action

Unlike conventional drugs that often target a single pathway, herbal medicines act through multiple mechanisms simultaneously. The combined anti-inflammatory, antioxidant, immunomodulatory, and chondroprotective effects of medicinal plants provide comprehensive therapeutic benefits in rheumatoid arthritis management. This multi-target action may improve treatment efficacy and reduce adverse effects associated with long-term synthetic drug therapy.

Comparative Analysis of Both Plants

Parameter	<i>Nyctanthes arbor-tristis</i>	<i>Calotropis gigantea</i>
Major constituents	Iridoids, flavonoids	Cardiac glycosides
Anti-inflammatory activity	Strong	Strong
Antioxidant activity	High	Moderate–High
Toxicity	Low	Moderate
Traditional use in arthritis	Widely used	Traditionally used
Safety profile	Better	Needs caution

RESULT AND DISCUSSION-

The present review highlights the significant therapeutic potential of *Nyctanthes arbor-tristis* and *Calotropis gigantea* in the management of Rheumatoid Arthritis. Analysis of the available scientific literature revealed that both medicinal plants possess diverse phytochemical constituents and multiple pharmacological activities that may contribute to their anti-arthritic effects. Experimental findings from phytochemical, pharmacological, and ethnomedicinal studies indicate that these plants exhibit anti-inflammatory, antioxidant, analgesic, and immunomodulatory properties which are beneficial in reducing rheumatoid arthritis progression and associated complications.

Phytochemical investigations demonstrated that *Nyctanthes arbor-tristis* contains important bioactive compounds such as flavonoids, iridoid glycosides, tannins, alkaloids, phenolic compounds, and essential oils. These phytoconstituents are known to exhibit strong antioxidant and anti-inflammatory activities. Experimental studies reported that extracts of *Nyctanthes arbor-tristis* significantly reduced paw edema, inflammatory cell infiltration, and oxidative stress markers in arthritic animal models. The plant was also found to inhibit the production of pro-inflammatory cytokines including TNF- α , IL-1 β , and IL-6, which are major mediators involved in rheumatoid arthritis pathogenesis. Additionally, its analgesic activity contributed to reduction of joint pain and stiffness, thereby improving mobility and functional outcomes in experimental studies.

Similarly, *Calotropis gigantea* showed promising anti-arthritic potential due to the presence of cardiac glycosides, flavonoids, terpenoids, saponins, alkaloids, and phenolic compounds. Pharmacological studies demonstrated that extracts of the plant effectively suppressed



inflammatory responses and reduced joint swelling in arthritis models. The anti-inflammatory activity of *Calotropis gigantea* is mainly attributed to inhibition of cyclooxygenase enzymes, suppression of inflammatory mediators, and stabilization of lysosomal membranes. Furthermore, antioxidant phytochemicals present in the plant help neutralize reactive oxygen species and reduce oxidative damage associated with chronic inflammation. Several studies also suggested immunomodulatory effects that may help regulate abnormal immune responses involved in rheumatoid arthritis.

Comparative evaluation of both medicinal plants suggests that *Nyctanthes arbor-tristis* possesses comparatively better safety and lower toxicity, making it a potentially safer option for long-term therapeutic use. In contrast, although *Calotropis gigantea* exhibits potent anti-inflammatory and analgesic effects, certain studies have reported possible toxicity associated with excessive use of its latex and extracts, indicating the need for careful dose standardization and toxicological assessment. Despite this limitation, both plants demonstrate substantial potential as complementary or alternative therapeutic agents for rheumatoid arthritis management.

The reviewed literature also emphasizes that the therapeutic effectiveness of these plants is associated with their multi-target mechanisms of action. Unlike conventional synthetic drugs that mainly target specific inflammatory pathways, herbal medicines exert combined anti-inflammatory, antioxidant, immunomodulatory, and chondroprotective effects. Such synergistic actions may provide improved therapeutic outcomes with comparatively fewer adverse effects. Moreover, the presence of multiple phytochemicals in these plants contributes to broader pharmacological activity against various pathological processes involved in rheumatoid arthritis.

Although preclinical findings are highly encouraging, the review identified several research gaps that limit clinical application. Most studies were limited to in vitro experiments and animal models, while well-designed human clinical trials remain insufficient. Standardization of herbal extracts, identification of active constituents, dosage optimization, toxicity evaluation, and long-term safety studies are still required. Furthermore, advanced research approaches including molecular docking, pharmacokinetic studies, and nanoformulation development may enhance the therapeutic efficacy and bioavailability of these medicinal plants in future anti-arthritic therapy.

Overall, the findings of the present review support the potential role of *Nyctanthes arbor-tristis* and *Calotropis gigantea* as valuable medicinal plants for rheumatoid arthritis management. Their diverse pharmacological activities and traditional therapeutic applications indicate promising scope for development of effective herbal formulations aimed at safer and more comprehensive treatment of rheumatoid arthritis.

REFERENCES

1. Smolen JS, Aletaha D, McInnes IB. Rheumatoid arthritis. The Lancet. 2016;388(10055):2023–2038.
2. Firestein GS, McInnes IB. Immunopathogenesis of rheumatoid arthritis. Immunity. 2017;46(2):183–196.
3. Guo Q, Wang Y, Xu D, Nossent J, Pavlos NJ, Xu J. Rheumatoid arthritis: pathological mechanisms and modern pharmacologic therapies. Bone Research. 2018;6:15.
4. Chopra A, Doiphode VV. Ayurvedic medicine core concept, therapeutic principles, and current relevance. Medical Clinics of North America. 2002;86(1):75–89.
5. Ahmad N, Fazal H, Abbasi BH, Rashid M, Mahmood T, Fatima N. Efficient regeneration and antioxidant potential in *Nyctanthes arbor-*



- tristis*. African Journal of Biotechnology. 2007;6(8):978–982.
6. Khatune NA, Mosaddik MA, Haque ME. Antibacterial activity and cytotoxicity of *Nyctanthes arbor-tristis*. Fitoterapia. 2001;72(4):412–414.
7. Saxena RS, Gupta B, Saxena KK, Singh RC, Prasad DN. Study of anti-inflammatory activity in leaves of *Nyctanthes arbor-tristis*. Journal of Ethnopharmacology. 1984;11(3):319–330.
8. Jain PK, Soni P, Upmanyu N, Shivhare Y. Evaluation of analgesic and anti-inflammatory activity of *Calotropis gigantea*. International Journal of Pharmaceutical Sciences and Research. 2010;1(2):1–5.
9. Habib MR, Karim MR. Evaluation of anti-inflammatory and antioxidant activity of *Calotropis gigantea* leaf extract. Journal of Applied Pharmaceutical Science. 2011;1(8):44–47.
10. Kumar VL, Arya S. Medicinal uses and pharmacological properties of *Calotropis gigantea*. Indian Journal of Pharmacology. 2006;38(1):14–17.
11. Pandey A, Tripathi S. Concept of standardization, extraction, and phytochemical screening methods in herbal drugs. Journal of Pharmacognosy and Phytochemistry. 2014;2(5):115–119.
12. Choy E. Understanding the dynamics: pathways involved in the pathogenesis of rheumatoid arthritis. Rheumatology. 2012;51(Suppl 5):v3–v11.
13. Alamgeer, Utra AM, Hasan UH. Anti-arthritic activity of medicinal plants: a review. Journal of Applied Pharmaceutical Science. 2017;7(1):234–251.
14. Gupta VK, Kumar S. Plants as potential anti-inflammatory agents: a review. Hygeia Journal for Drugs and Medicines. 2012;4(1):1–8.
15. World Health Organization. WHO traditional medicine strategy 2014–2023. World Health Organization. Geneva: WHO; 2013.

HOW TO CITE: Modhave Rutuja, Shraddha Khaladkar, Payal Padwal, More Nisha Comprehensive Review:- Therapeutic Potential of *Nyctanthes arbor-tristis* and *Calotropis gigantea* in Rheumatoid Arthritis, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 5, 5764-5770, <https://doi.org/10.5281/zenodo.20342021>

