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Review Article

A review on medicinal plants used in the treatment of rheumatoid arthritis

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Abstract

Rheumatoid arthritis is an autoimmune disease that causes chronic inflammation in the joints. It usually attacks synovial joints and cartilage, causing joint destruction and long-term disability. Herbal medicines are becoming more popular in recent years due to their safety, efficacy, and ease of access. There have been numerous reports of medicinal plants being used to treat Rheumatoid arthritis. The current review summarises the use of medicinal plants in the treatment of rheumatoid arthritis.

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Introduction

Rheumatoid arthritis (RA) is a long-term autoimmune disorder that primarily affects joints. It typically results in warm, swollen, and painful joints. Pain and stiffness often worsen following rest. Most commonly the wrist and hands are involved, with the same joints typically involved on both sides of the body. It may affect parts of the body including skin, eyes, lungs, heart, nose, and blood. This results in low red blood cell count, and inflammation around the lungs and heart. Often, symptoms come on gradually over weeks [1].

Pathophysiology

Rheumatoid arthritis (RA) is considered an autoimmune disease in which a pathologic immune response attacks synovial cells, cartilage, and bone resulting in joint destruction and permanent disability. Clinicians have become increasingly aware of a strong component of genetic predisposition rendering individuals susceptible to

the disease. Usually, the genes are activated by a "trigger," such as an infection or an environmental stimulus. The immune system reacts incorrectly to this trigger when it is present in the body. The immune system starts creating molecules that damage the joint instead of defending it [2]. Rheumatoid arthritis is brought on as a result. In healthy joints, there are very few blood vessels and they are quite thin. But, in joints affected by rheumatoid arthritis, the lining is very thick and packed with white blood cells. The white blood cells release chemicals including tumor necrosis factor alpha (TNF-alpha) and interleukin-1 (IL-1), which cause joint injury, swelling, and discomfort. Synovial fibroblasts and chondrocytes in the surrounding articular cartilage are stimulated by cytokines such as interleukin-17, interleukin-18, and Receptor activator of nuclear factor-kappa B ligand (RANKL) [3].

Signs and symptoms

Joint pain, swelling, and warmth Loss of appetite, fatigue, and fever. Pain in the joint particularly that connect your fingers to your hands and your toes to your feet, smaller joints are frequently affected initially by

early rheumatoid arthritis. As the condition worsens, the shoulders, elbows, hips, and wrists frequently begin to exhibit symptoms. Typically, both sides of your body's same joints will have discomfort.

Risk factors

Sexual orientation- In comparison to men, women are more likely to acquire rheumatoid arthritis.

Age- Although rheumatoid arthritis can strike at any age, it often develops in middle age.

Family background- One may be more susceptible to developing rheumatoid arthritis if a family member does.

Smoking- Smoking raises your chance of getting rheumatoid arthritis, especially if you are genetically predisposed to the condition. Moreover, smoking seems to be linked to a worsening of illness symptoms.

Excess weight- Overweight people seem to have a slightly increased risk of rheumatoid arthritis [4].

Medicinal plants used in the treatment of Rheumatoid arthritis

Herbal medications, often known as Herbalism or Botanical medicines, are employed for their therapeutic or medical significance on several levels. To offset the negative consequences of pathogenic hazards, alternative and complementary therapies must be developed further. In economically destitute nations where traditional medicine is still widely practised, cost-effective, logically developed herbal medicine solutions must be provided (5, 6). Various herbs utilized to treat Rheumatoid arthritis follows

1). Aloe vera

Biological Name: *Aloe barbadensis*

Common Name: Curacao aloe, Lily of the desert

Family: Liliaceae

- In addition to several locations throughout India, particularly the north-western Himalayan region, *Aloe barbadense* is grown in Europe. One of the most crucial herbs for traditional medicine has been used. The components in *Aloe vera* plants that give it its activity are anthracene, cinnamic acid, and anthranilic acid.
- *Aloe vera* is used to treat a range of skin conditions, including small wounds, insect stings, bruises, poison ivy, and eczema. Additionally, it possesses anti-fungal and antibacterial properties [7].
- *Aloe vera* contains a chemical called anthraquinone that has anti-arthritis properties. *Aloe vera* is an effective anti-inflammatory and immune system

stimulant. *Aloe vera* extract used topically reduces arthritis and inflammation in Sprague Dawley rats with adjuvant-induced arthritis [8].

2). Ashwagandha

Biological Name: *Withania somnifera* Linn.

Common Name: Winter cherry, withania root

Family: Solanaceae

- Traditional medical practices such as Ayurveda and Unani have both used the roots of ashwagandha.
- Alkaloids and steroidal A significant old plant is ashwagandha, sometimes referred to as Indian ginseng. The Indian lactones are thought to be responsible for the root's pharmacological effect. Withanine, withanine, pseudo-withanine, tropine, pseudo-tropine, somniferine, and somnine are some of the alkaloids that are primarily visible [9].
- Ashwagandha is supported for usage in clinical trials and animal studies.
- In adjuvant-induced arthritic rats, oral treatment of *Withenia somnifera* Linn., root powder demonstrated an anti-arthritic action [10].

3). Shallaki:

Biological Name: *Boswellia serrata* Linn.

Common Name: Boswellia/Indian Frankincense

Family: Burseraceae

- A moderate to large branching tree called *Boswellia serrata* Linn can be found in India, Northern Africa, and the Middle East. It can be found in Bihar, Gujarat, and Madhya Pradesh in India. There are strips of *Boswellia* bark removed, revealing a gummy-oleo resin [11]. The resin portion of it contains *Boswellia* acid, which has been proven to have anti-inflammatory, anti-atherosclerotic, and anti-arthritic properties. The gummy oleo resins extract has also been used as an astringent, stimulant, sedative, analgesic, anti-atherosclerotic, expectorant, and antiseptic [12].
- *Boswellia serrata* extract has natural anti-inflammatory properties which can act on chronic inflammatory conditions.
- *Boswellia serrata* Linn decreases the breakdown of glycosaminoglycan production and non-steroidal anti-inflammatory medicines (NSAIDs) can speed up the damage to the articular cartilage in arthritic situations [13].

4). Black pepper

Biological Name: *Piper nigrum* Linn.

Common Name: Pepper

Family: Piperaceae

- In South India, black pepper is a commonly grown plant. Additionally, it is grown in Malaysia, Sri Lanka, Indonesia, Brazil, and Brazil. India ranks as the top country for drug cultivation.
- There is an alkaloid present in pepper known as piperidine which is responsible for showing anti-arthritis activity and it also contains starch, volatile oil, pungent resins, and piperine [14].
- As per studies, extracted piperine from black pepper when given orally for eight days at doses of 20 and 100 mg/kg/day, carrageenan-induced acute paw arthritis symptoms improve [15].

5). Black cohosh

Biological Name: *Actaea racemosa* Linn.

Common Name: Black snakeroot, bug wort

Family: Ranunculaceae

- The smooth perennial herbaceous plant is known as black cohosh. From the far south of Ontario to central Georgia and west to Missouri and Arkansas, it is indigenous to eastern North America.
- The rhizomes and roots are cultivated by Native Americans which employed the medicinal uses of black cohosh [16].
- It contains actin, cymaroside, steroidal terpenes, and 27-deoxyactin and tannins as chemical constituents.
- Black cohosh reduces the swelling caused by arthritis [17].

6). Caesalpinia sappan

Biological Name: *Caesalpinia sappan* Linn. (CP)

Common Name: sappanwood, bakam, patang

Family-Leguminosae

- South India, Madhya Pradesh, Orissa, West Bengal, and Sri Lanka are among the regions that frequently have CP [18].
- The CP's Heartwood IS is used historically to cure conditions like ulcers, leprosy, rheumatism, skin conditions, diarrhea, dysentery, epilepsy, convulsions, diabetes, odontopathy, and stomatopathy [19, 20]
- The heartwood of the CP has astringent, refrigerant, acrid, bitter, sweet, constipating, sedative, and hemostatic properties.
- In Wistar rats, the ethanolic extract of CP wood at dosages of 1.2, 2.4, and 3.6 g/kg showed anti-

arthritic efficacy by lowering the levels of IL-1, IL-6, TNF-, and prostaglandin E2 (PGE2) in serum. The investigation concluded that CP has anti-arthritis properties in rats [21].

7). Liquorice

Biological Name: *Glycyrrhiza glabra*

Common Name: Black sugar, Sweetwood, mulaith

Family-Leguminosae

- The liquorice root contains a variety of biologically active substances, including glycyrrhizin, its aglycone, glycyrrhetic acid, flavones, flavonols, isoflavones, chalcones, bihydroflavones, and bihydrochalcones [22,23].
- Liquorice GL and GA's active ingredients may have anti-inflammatory actions by, at least in part, inhibiting COX-2 and its downstream product TxA2. Moreover, it has recently been discovered that the COX-2/TxA2 pathway, an auto-regulatory feedback loop, is a key mechanism underlying the pathogenesis of Rheumatoid Arthritis [24].

8). Polygonum

Biological Name: *Polygonum viviparum* Linn

Common Name: Alpine Bistort

Family-Polygonaceae

- *P. viviparum* is a common plant that grows between 1,900 and 4,200 meters above sea level in both the arctic and alpine regions of the northern hemisphere. It is an example of an environment's herbaceous perennial growth habit.
- It is used in traditional medicine to treat illnesses of the big and small intestines, diarrhea, fever from pneumonia, and wounds. Moreover, it facilitates expectoration and relieves cough [25].
- A study looked at the effects of polygonum viviparum L. rhizome methanol extract on both acute and chronic inflammation. To measure acute inflammation, carrageenan, and dextran-induced paw edema assays were utilized, whereas mycobacterium-induced arthritis and formaldehyde arthritis were used to measure chronic inflammation.
- In both acute and chronic inflammatory models, this study's findings showed a significant reduction in paw inflammation up to 250 mg/kg. In contrast to the reduction of chronic inflammation, which can reach 44%, the inhibi-

tion of acute inflammation ranged from 18 to 34% [26].

9). Cinnamon

Biological Name: *Cinnamomum zeylanicum*

Common Name: Dalchini

Family- Lauraceae

- The bark, leaves, and essential oils for cinnamon are derived from the native tree, *Cinnamomum zeylanicum* (*C. zeylanicum*), which is located in Sri Lanka.
- Cinnamaldehyde is abundant in cinnamon bark oil. B-caryophyllene, linalool, and other terpenes are also present in addition to these. *Cinnamomum zeylanicum* bark includes dimeric, trimeric, and higher oligomeric proanthocyanidins with doubly linked bis-flavan-3-ol units in the molecule. *Cinnamomum zeylanicum* bark is used as a spice and herbal medicine.
- The potential was investigated. Rat rheumatoid arthritis and inflammation in animal models were studied using Type-A procyanidine polyphenols (TAPP) isolated from cinnamon bark. In vitro studies suggest that Type-A procyanidine polyphenols (TAPP) have the potential for immunomodulation and anti-inflammatory effects. The experimental models for inflammation and arthritis in rats were adjuvant-induced established arthritis (AIA) and carrageenan-induced rat paw edema (CPE) [27].

10). Myrobalan

Biological Name: *Terminalia chebula* Retz.

Common Name: Haritaki.

Family: Combretaceae

- Chebula Retz is known as the "King of Medicine" in Tibet and is consistently at the top of the list of "Ayurvedic Materia Medica" due to its exceptional therapeutic abilities. *T. chebula* is a widely used herb in Ayurveda, Unani, and homeopathic treatment and has gained popularity in contemporary medicine [28].
- Chemical components such as arjunglucoside, trans-cinnamic acid, triethyl ester of chebulic acid, arjunic acid, arjungenin, and daucosterol are found in *Terminalia chebula*.
- The entire plant has great medicinal potential and has historically been used to cure conditions such as gout, heart disease, asthma, sore throats, vomiting, hiccoughs, diarrhea, dysentery, and bleeding piles [29].

- The plant has been shown to have a wide range of pharmacological and therapeutic properties, including anti-inflammatory, anti-mutagenic, anti-proliferative, hepatoprotective, anti-inflammatory, anti-proliferative, radioprotective, cardioprotective, anti-arthritis, and activity for gastrointestinal motility and wound healing.

11) *Tinospora cordifolia*

Biological Name: *Tinospora cordifolia* linn

Common Name: Guduchi

Family: Menispermaceae

- *T. cordifolia*, which has immunomodulatory properties, has a notable anti-inflammatory impact in both acute and subacute inflammation and is utilized as adjuvant therapy in diabetic patients with foot ulcers. In cases of acute inflammation, *T. cordifolia* proved to be more efficient than acetylsalicylic acid [30].
- Tinocardifolin, columbin, colombine, picroretin, tinocardifolioside, tinosponone, tinocardioside, and cordioside are the chemical components of *T. cordifolia* [31].
- In the Indian Ayurvedic medical system, *Tinospora cordifolia* is used to treat diabetes, rheumatoid arthritis, jaundice, and as an immunostimulant [32].

Conclusion

Arthritis is associated with swelling and tenderness of one or more joints. The main symptoms of arthritis are joint pain and stiffness, which typically worsen with age. The most common types of arthritis are osteoarthritis and rheumatoid arthritis. Arthritis affects millions of adults and only a few types can be cured. That said, the focus of arthritis treatment must then be on slowing the progression of the disease and controlling the symptoms. By doing so, one can preserve joint function and decrease the severity of the disease. If a person is diagnosed with rheumatoid arthritis, then a combination of Disease-modifying anti-rheumatic drug (DMARDs) tablets shall be preferred as part of the initial treatment. These medicines ease the symptoms of the condition and slow down its progression. Herbal medicines have grown in popularity in recent years due to their safety, efficacy, and accessibility. Medicinal plants have been used to treat Rheumatoid arthritis in numerous reports. Extensive research is required to understand the molecular mechanism of these medicinal plants, and additional studies are required to validate these herbs before clinical use.

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