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Ankita Yashwant Gawai
Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Pooja R Hatwar
Department of Pharmaceutics, Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Ravindra L Bakal
Department of Pharmaceutical Chemistry, Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Krushnali N Nehar
Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Pranali R Bhujade
Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Corresponding Author:
Ankita Yashwant Gawai
Shri Swami Samarth Institute of Pharmacy, At Parsodi, Dhamangaon Rly, Amravati, Maharashtra, India

Herbal drug used in treatment of arthritis

Ankita Yashwant Gawai, Pooja R Hatwar, Ravindra L Bakal, Krushnali N Nehar and Pranali R Bhujade

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Abstract
Arthritis is a chronic condition characterized by joint inflammation, pain, and stiffness, affecting millions worldwide. Two major types of arthritis are Osteoarthritis (OA) and *Rheumatoid Arthritis* (RA). OA is a degenerative joint disease caused by biomechanical and inflammatory processes, while RA is a chronic autoimmune disease resulting from genetic, environmental, and stochastic factors. Herbal medicines have gained popularity as alternative treatments for arthritis due to their anti-inflammatory and antioxidant properties. This review highlights the benefits of herbal drugs in treating arthritis, focusing on eight herbal medicines: *Turmeric, Ginger, Willow bark, Boswellia serrata, Withania somnifera, Aloe vera, Cinnamomum cassia, and Coriander sativum.* These herbal remedies have shown potential in reducing inflammation, pain, and joint damage, improving the quality of life for arthritis patients. Understanding the etiology and symptoms of arthritis is crucial for early diagnosis and effective treatment. Herbal medicines offer a promising approach to managing arthritis.

Keywords: Herbal drug, rheumatic arthritics, osteoarthritics anti-inflammatory, antioxidant

1. Introduction
Cartilage degradation is a feature of arthritis. Normally, cartilage shields a joint, enabling smooth motion [1]. The word arthritis, which comes from the ancient Greek phrase "diseases of the joints", describes inflammation that is accompanied by pain or structural damage [2]. Inflammation in one or more joints is a common symptom of arthritis, which causes pain and reduced mobility [3]. One of the most common complaints among the elderly is joint pain, which alters the elderly boy's body and causes discomfort when touched, limitations in activities, swelling, stiffness, and inflammation. In addition to causing discomfort, joint pain can result in disability, which lowers the quality of life for the elderly by interfering with daily activities [4]. A variety of arthritic diseases, including those caused by degenerative diseases and autoimmunity, are collectively referred to as arthritis. Chronic inflammation of one or more joints, which typically results in pain and is frequently incapacitating, is its defining feature. Joint pain, swelling, stiffness, and restricted mobility are the primary clinical symptoms [5]. There are more than 100 types of arthritis, and it is a chronic condition [6].
Ankylosing spondylitis, gout, juvenile idiopathic arthritis, osteoarthritis, psoriatic arthritis, reactive arthritis, *Rheumatoid Arthritis*, septic arthritis, calcium pyrophosphate deposition disease, crystal arthritis, bacterial infections, systemic lupus erythematosus (SLE), reactive arthritis, chronic childhood arthritis, fibromyalgia, lupus, scleroderma, post-traumatic arthritis, hemochromatosis arthritis, enteropathic arthritis, vasculitic arthritis, giant cell arthritis, Behçet's disease, relapsing polychondritis, gonococcal arthritis, pseudogout, and relapsing polychondritis are the most common types of arthritis [7].
There are mainly major two types of arthritis
1 Osteoarthritis (OA) and
2 Rhuematoid arthritis (RA) [6]

1.1 Rhuematoid Arthritis (RA)
One of the challenging problems associated with inflammatory diseases is *Rheumatoid Arthritis* (RA) [8]. The main symptom of *Rheumatoid Arthritis* (RA), a chronic, progressive inflammatory and systemic autoimmune disease, is symmetric polyarthritis in the hands and feet. It causes severe joint destruction, chronic pain, and significant disability [9] Inflammation of the synovial tissue in the hands' and feet's joints is the main cause of RA, a chronic immune-mediated condition [10].

Chronic synovial inflammation, cartilage and joint erosion, pannus formation, joint abnormalities, and ankylosis are the features of *Rheumatoid Arthritis* (RA), a chronic autoimmune disease that is becoming more and more common worldwide [11]. The remodeling and destruction of joints and surrounding tissues are features of RA, an inflammatory autoimmune disease [12]. Co-morbidities that primarily impact systemic bone, vasculature, metabolic function, and cognition are among the broader clinical sequelae of *Rheumatoid Arthritis* (RA), a chronic destructive inflammatory synovitis [13]. RA is a multifactorial disease caused by genetic, environmental and stochastic factors [14]. Although it starts in the joints, it spreads to the kidneys, skin, heart, lungs, and eyes [15].

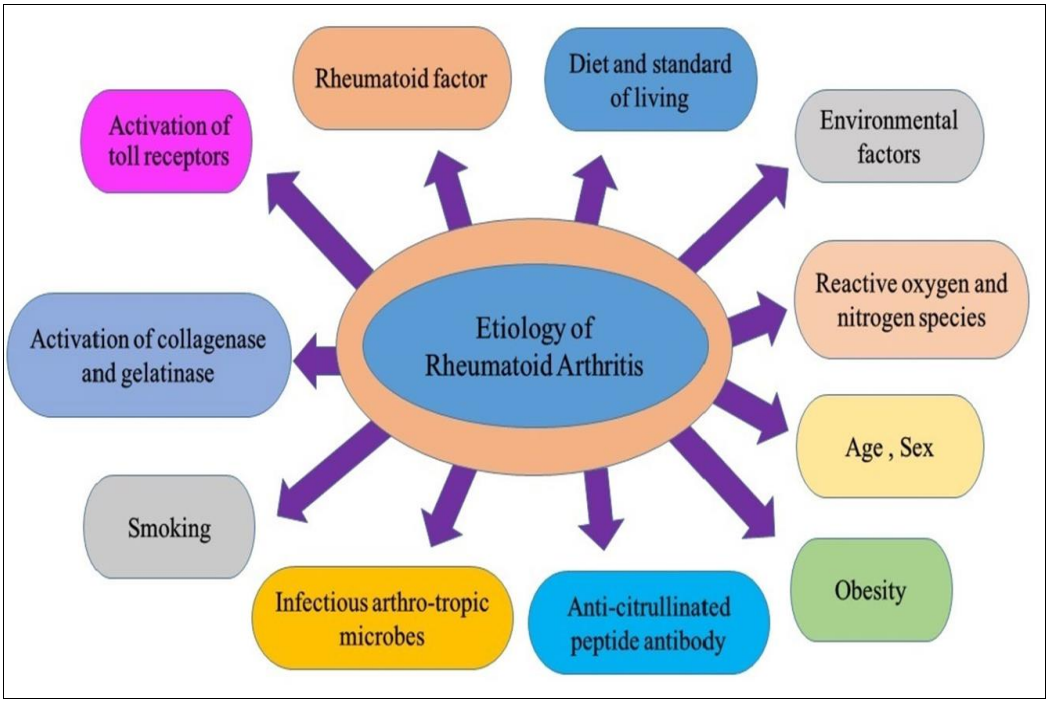

Fig 1: Etiology of *Rheumatoid Arthritis* [16].

***Rheumatoid Arthritis* can appear as [17, 6, 5, 18-20]**

1 Swelling and stiffness of the joints
2 Inflammation
3 Exhaustion
4 A fever
5 Loss of weight
6 Hot and tender joints
7 Ineffectiveness.
8 Ankles, knees, and wrist pain.
9 Resulting in loss of function.
10 Causing irreversible joint disability.
11 Swelling and stiffness of the joints

1.2 Osteoarthritis (OA)

One condition that affects synovial joints is osteoarthritis (OA) [17]. The most prevalent joint disease is osteoarthritis (OA). It is growing more common in the elderly population and presents a serious challenge to healthcare systems because it is still incurable [21]. Osteoarthritis is more common as people age, and trauma and obesity may exacerbate the condition [10]. One such condition associated with both acute and chronic inflammation is osteoarthritis (OA), a chronic joint disease [22]. Osteoarthritis (OA) is the most common of arthritis, causing disability in 24% of adults [23]. The progressive degeneration of the articular cartilage is a characteristic of osteoarthritis (OA), a chronic degenerative joint disease [24].

Osteoarthritis frequently develops in the knee, hip, ankle, hand and foot joints, and spine [23].

It's believed that OA is caused by [20-23].

1. Biomechanical and inflammatory processes related to injury
2. Age
3. Oxidative and
4. Mechanical stress
5. Obesity
6. Metabolic disease
7. Environment factor
8. Smoking

Risk factors for developing osteoarthritis include in particular [25, 6].

1. Female sex,
2. Obesity
3. Joint injuries
4. Repetitive Stress on Joints
5. Genetics
6. Joint Misalignment
7. Muscle Weakness

Its main symptoms include [20, 26]

1. Joint pain
2. Stiffness
3. Decreased joint function
4. Impairment in activities of daily living
5. Resulting from damage to the entire joint
6. Articular cartilage
7. Subchondral bone

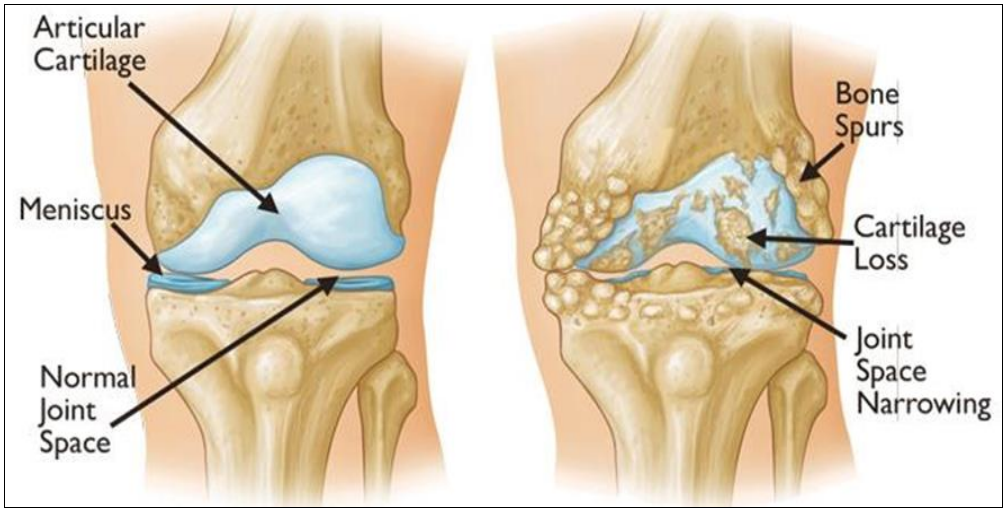

Fig 2: Osteoarthritis affected joint [6]

2. Herbal Medical Treatment

Herbal plants have been used to treat inflammatory diseases like arthritis both internally and externally [27]. Due to their comparatively low side effects, natural medicines have gained popularity as alternative treatments for inflammation in recent years [28]. Herbs, herbal preparations, herbal materials, and completed herbal products that use plants, plant-based compounds, or combinations of them as active ingredients are all considered forms of herbal medicine [29]. Many herbal medicines are used for the clinical treatment of RA because of their remarkable curative effects [30].

2.1 benefits of herbal drug in treatment of arthritis [6]

Compared to some pharmaceutical formulation, herbal medications for arthritis may have fewer side effects, pain relief, and possible anti-inflammatory qualities.

- **Anti-inflammatory Properties:** Several herbs have anti-inflammatory qualities that may aid in lowering inflammation, which is a common cause of *Rheumatoid Arthritis* and osteoarthritis.
  B) Pain Relief: Because of their well-known analgesic qualities, some herbs may be able to reduce arthritis-related pain.
- **Fewer Side Effects:** Although herbal remedies can occasionally cause side effects and interact with other medications, they may have fewer negative effects than conventional pharmaceuticals.
  D) Proper Joint Function: Some herbal remedies may help people with arthritis live better lives by increasing joint mobility and function.

3. Herbal Drug

3.1 Turmeric

- **Synonyms:** *Indian saffron, Haldi, Haridra, Pian jiang huang, Racine de curcuma, Radix curcumae, Yujin, and Curcuma, Curcuma aromatica,* and *Curcuma domestica*.
- **Biological source:** The dried rhizome of *Curcuma longa* Linn.
- **Family:** Zingiberaceae
- **Chemical components:** Curcuminoids (5%), Dihydrocurcumin, Curcumin I (60%) and Curcumin II & III. Zingiberene (25%), α-phellandrene, turmerones, arturmerone. Additional substances include eugenol, camphor and cineole.
- **Geographical sources:** West and East Africa, China, Sri Lanka, and other tropical nations [31].

Turmeric is one of nature's most potent anti-inflammatories [32]. It aids in the management of inflammatory and oxidative diseases, arthritis, anxiety, metabolic syndrome, and hyperlipidemia [22].

Table 1: *Turmeric (Curcuma longa)* belongs to the following taxonomic category [33]

Kingdom	Plantae (plants)
Clade	Angiosperms (flowering plant)
Clade	Monocotyledons (monocotyledons)
Order	Zingiberales
Family	Zingiberaceae
Family	*Turmeric*
Species	*Curcuma Longa*

Fig 4: Turmeric powder [34]

Use of *turmeric* in treatment of arthritis

Curcumin promotes the mechanism of action of NF-B as a possible anti-inflammatory factor and has the ability to prevent its activation as well [35]. *Curcumin* is one of the primary compounds present in the rhizome of C. longa, is considered for its powerful anti-inflammatory and antioxidant properties [12]. *Curcumin* treatment is safe and does not have any negative side effects, according to studies evaluating its effectiveness and safety both alone and in combination with diclofenac sodium in patients with active *Rheumatoid Arthritis* (RA) [36]. *Curcumin* inhibits synovial fibroblast and chondrocyte apoptosis. Herbal medicines have potent anti-inflammatory, anti-oxidant, and anti-arthritic properties [6]. In an animal model that replicated human osteoarthritis,

Bethapudi showed that oral administration of turmeric extract, which contains 57% of the bioactive turmerosaccharides, significantly reduced the effects of pain and inflammation. The analgesic effect of this turmeric extract on osteoarthritis pain was comparable to that of tramadol [37].

3.2 Ginger

- **Synonym:** *Gingerin, Rhizoma zingiberis, Zingibere, Zingiber,* and *Zingiberis.*
- **Biological source:** Ginger comes from the rhizome, or underground stem, of the *Zingiber officinale* plant.
- **Family:** Zingiberaceae [7].

Another popular spice and food additive that has been recommended to help RA symptoms is *ginger* [38]. *Ginger* has becoming more popular in the treatment of RA [39].

Fig 5: *Ginger rhizome* [40].

One of the efficient treatments for arthritis joint pain that doctors recommend is *ginger* extract [41]. The anti-inflammatory qualities of *ginger*, or zingiber, may help reduce the symptoms of osteoarthritis. According to some research, it might help enhance joint function and lower pain. Bioactive substances found in ginger include gingerol, which has been investigated for possible anti-inflammatory properties [6]. *Ginger* treatment has decreased PGE2, NO, IL-1β, IL-12, TNF-α, and monocyte chemoattractant protein-1 (MCP-1). It has also controlled activation and normal T cell expression and secretion (RANTES) [42].

3.3 Willow bark

- **Synonyms:** White willow bark, brittle willow, and simply willow. Crack willow (Salix fragilis), purple willow (Salix purpurea), and weeping willow (Salix babylonica).
- **Biological source:** *Willow bark* is obtained from the dried bark of Salix species, mainly *Salix Alba*, Salix purpurea, and Salix fragilis (family Salicaceae). It is a natural source of salicin.
- **Chemical constituents:** Salicin, Flavonoids (e.g., quercetin, kaempferol, catechins, naringenin), Polyphenols (e.g., tannins, cinnamic acid derivatives), Phenolic glycosides (e.g., salicortin, fragilin), Tannins, Alkaloids, Essential oils [7].

The bark of many willow tree species is used to make *willow bark*, which has long been used for its therapeutic qualities. After consumption, the body converts salicin to salicylic acid, which has antipyretic, analgesic, and anti-inflammatory effects [39]. *Willow bark* has long been used to treat pain and fever because it contains salicylates and flavonoids [43]. It has been suggested that catechol contributes to the analgesic and anti-inflammatory properties of willow bark since it is known to suppress many inflammatory indicators *in vitro* [44]. One of the earliest examples of a contemporary drug being developed from an herbal remedy is willow bark extract. Its antipyretic, analgesic, and anti-inflammatory properties have led to its use for thousands of years [45].

Fig 6: *Willow bark* [40]

3.4 *Boswellia serrata*

- **Biological Name:** *Boswellia serrata Linn.*
- **Common Name***: Boswellia/Indian Frankincense*
- **Family:** Burseraceae [41].

Fig 7: *Boswellia serrata* Linn [41].

The most significant herbal remedies used to treat a variety of diseases are *Boswellia serrata* Roxb, a member of the Burseraceae family, also known as salai guggal, white guggal, loban, kundur, dhup, and Indian olibanum, or shallaki in Sanskrit. In India, the tree grows in dry hilly regions [46]. Additionally, it can be found in Arabica, North Africa, and South America [27]. It contain ethyl acetate (21.4%), octyl acetate (13.4%), and methylanisole (7.6%), it also contains mono-(13%) and diterpenes (40%) [47].

Frankincense, another name for *Boswellia* [42]. *Boswellia serrata* is a well-known Ayurvedic remedy for inflammatory diseases and rheumatic pain. Recent randomized clinical trials have shown that extracts of *Boswellia serrata* improved Western Ontario and McMaster Universities Osteoarthritis Index and visual analog scale scores, decreased inflammatory cytokines, and relieved arthritis-related pain and stiffness from knee osteoarthritis [48].

The resin contains β-boswellic acid which has anti-inflammatory, anti-atherosclerotic and anti-arthritic properties [41]. In addition to its analgesic and anti-arthritic properties, this herb has anti-inflammatory properties, such as inhibiting microsomal prostaglandin E2 (PGE2) synthase-1 and 5-

lipoxygenase, lowering the production or activation of inflammatory mediators like matrix metalloproteinase (MMP)-9, MMP-13, cyclooxygenase (COX)-2, and nitric oxide (NO). It is believed that boswellia helps arthritis by reducing osteophytes, increasing the gap between the knees, and decreasing inflammatory mediators linked to knee OA, like hyaluronic acid and C-reactive protein [42].

3.5 *Withania Somnifera*

- **Biological Name:** *Withania somnifera Linn*.
- **Common Name:** *Winter cherry, Withania root*
- **Family:** Solanaceae [41]

Fig 8: Dried roots of *Withania somnifera* Linn [40]

Ashwagandha, also known as *Withania somnifera* (L.) Dunal, a member of the Solanaceae family, is used in Ayurveda to treat a number of conditions, such as hepatitis, arthritis, amnesia, asthma, anxiety, cardiovascular disease, and neurodegenerative diseases [12]. *Ashwagandha, or Withania somnifera*, is an Ayurvedic herb that has analgesic and anti-inflammatory properties. By reducing the activation of NF-κB and activator protein 1 (AP-1) signaling pathways, *Withania somnifera* extract has been shown to inhibit the production of TNF-α, IL-1β, and IL-12. By preventing collagenase activity, *Withania somnifera* extract also reduced the rate at which bovine Achilles tendon type I collagen degraded. In a collagen-induced arthritis, *Withania somnifera* treatment reduced ankylosis, deformity, swelling, and redness [42].
MOA: Decreased arthritis severity significantly [6]. In adjuvant-induced arthritis, oral administration of powdered *Withania somnifera linn* root demonstrated an anti-arthritic effect [41].

3.6 *Aloe vera*

- **Biological Name:** *Aloe barbadensis*
- **Common Name***: Curacao aloe, Lily* of the desert
- **Family:** Liliaceae [41].

Fig 9: *Aloe vera plant* and *Aloe vera* gel [49].

The Arabic word "*alloeh*" or the Hebrew word "halal" are the origins of the word "*aloe*", which means a shiny, bitter substance, while the Latin word "vera" means "true" [50]. For thousands of years, people have utilized aloe vera, a cactus-like plant that is a member of the Asphodelaceae (Liliaceae) family, for traditional medicinal purposes [49]. It conatain flavonoids, anthraquinones, terpenoids, alkaloids, alkaloids, carbohydrates, glycosides, tannins, saponins, phenols, and alkaloids [51]. *Aloe vera* gel contains substances like chromone and anthraquinones, it has very strong anti-inflammatory properties [52]. Commonly referred to as *Aloe vera* and Kumari in Ayurveda, *Aloe barbadensis* (Liliaceae) is abundant in several phytochemicals, including anthraquinones, anthranilic acid, cinnamic acid, and anthracene. The *aloe vera* plant is indigenous to southern Africa and features red or yellow flowers along with fleshy, spiny leaves [53]. The antiarthritis property of *aloe vera* is due to the anthraquinone compound [12]. The plant also contained anthraquinones and chromone, which possess strong anti-inflammatory effects on murine macrophages [54].
Aloe vera is a potent anti-inflammatory and immune-stimulating plant. *Aloe vera* extract applied topically reduces inflammation and arthritis in Sprague Dawley rats with adjuvant-induced arthritis [41].

3.7 *Cinnamomum cassia*

Table 2: Morphological classification of *Cinnamomum Zeylanicum* [55].

Kingdom	Plantae
Phylum	Magnoliophyta
Class	Magnoliopsida
Order	Laurales
Family	Lauraceae
Genus	*Cinnamomum*
Species	*Zeylanicum*

Fig 10: *Cinnamomum cassia* [40].

The dried inner bark of *Cinnamomum verum* (syn. *C. zeylanicum* Blume), an evergreen tree indigenous to India and Sri Lanka, is used to make cinnamon, which has been prized for centuries for its unique flavor and scent [37]. The tropical aromatic evergreen tree Cinnamomum cassia Presl, commonly referred to as cinnamon or cassia, belongs to the Lauraceae family and is frequently used in traditional Oriental medicine. Cardiovascular protection, cytoprotection, neuroprotection, immunomodulation, antitumor, anti-inflammatory, analgesia, antibacterial, antiviral, and anti-tyrosinase properties are all exhibited by C. cassia [56]. Eugenol, cinnamon aldehyde, and a number of other bioactive substances make up the majority of cinnamon essential oil [57]. One of the most popular traditional Chinese medications for treating OA is cinnamon. An essential bioactive component of cinnamon, cinnamic aldehyde (CA), has anti-inflammatory,

antipyretic, anticancer, antidiabetic, and antioxidant qualities [58].

In addition to being a popular spice, cinnamon has been shown to help manage RA symptoms [38].

3.8 *Coriander Sativum*

- **Biological Name:** *Coriander sativum*
- **Common Name:** Dhaniya [40].
- **Family:** Apiaceae [59].

Fig 11: *Coriander Sativum* [40]

The word "*coriandrum"* comes from the Greek words "koriannon," which means "stink bug," and "annon," which means "fragrant anise", because the plant has a distinct odor as its ages [60]. *Coriandrin* has a number of medicinal properties, including anti-inflammatory effects; studies have shown that it can effectively reduce inflammation, making it a potential candidate for managing inflammatory conditions like arthritis and asthma [61]. Plants of the *Coriandrum sativum* L (CS) contain bioactive compounds such as terpenoids, terpene, camphor, limonene and geraniol to name a few, which have anti-inflammatory, analgesic, and antioxidant activities that inhibit the development of arthritis by reducing symptoms like pain, swelling, and inflammations [62]. Its seeds are used in traditional medicine to relieve pain, inflammation, and *Rheumatoid Arthritis* [63]. C. *sativum* seeds have historically been used to treat inflammation, *Rheumatoid Arthritis*, and pain [64].

3.9 *Ehretia laevis Roxb (Khanduchakka)*

The genus Ehretia, belonging to the Boraginaceae family, has more than 150 species [65]. All Ehretia species are shrubs and trees *(Ehretia acuminata*) [67].

- **Botanical name:** *Ehretia laevis Roxb*.
- **Synonyms:** Ehretia laevis Var. platyphylla Merrill.
- **Common/Local Name:** *Khanduchakka* [66].
- **Geographical source:** Asia, Africa, Australia, Europe, and Northern America.
- **Phytoconstituents:** Phenolic acids, flavonoids, benzoquinones, cyanogenetic glycosides, fatty acids, and some other important compounds [67].

Table 3: Morphological characteristics of *khanduchakka* [69].

Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida
Order	Boraginales
Genus	*Ehretia*
Species	*Ehretia laevis* (Roxb)

Fig 12: Flower leaves and tree of *Ehretia laevis* [70]

Numerous species in the genus *Ehretia* shows a variety of biological properties, including antisnake venom, antibacterial, anti-inflammatory, and antioxidant properties. Antiarthritic action is supported by E. laevis therapy. The leaf extract proved to be the most successful of the three components the stem, leaf, bark, and fruit that are used [66]. The inclusion of active ingredients such oleanenic acid, hexadecanoic acid (palmitic acid), and other fixed oils may be the cause of this antiarthritic response [67].

4. Conclusion

Arthritis is a complex and multifaceted disease that requires a comprehensive treatment approach. Herbal medicines, with their anti-inflammatory and antioxidant properties, offer a promising alternative to conventional treatments. The eight herbal medicines reviewed here *Turmeric, Ginger, Willow bark, Boswellia serrata, Withania somnifera, Aloe vera, Cinnamomum cassia, and Coriander sativum* have shown potential in reducing inflammation, pain, and joint damage. These herbal remedies can be used in conjunction with conventional treatments to improve patient outcomes and quality of life. Further research is needed to fully understand the mechanisms of action and potential interactions of these herbal medicines. By exploring the benefits of herbal medicines, healthcare professionals can provide personalized care and improve treatment options for patients with arthritis. Ultimately, a holistic approach to managing arthritis can lead to better patient outcomes and improved quality of life.

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