Medicinal Plants as Anti-inflammatory Agents

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Abstract

The body's natural defense mechanism, where vascular tissues respond to harm or injury initiated by invaders like damaged cells, irritating constituents or pathogens called Inflammation. There are four distinct signs of inflammation Pain, redness, increased warmth, and swelling. Predominant treatment option commonly applied to treat inflammation Nonsteroidal anti-inflammatory drugs (NSAIDs). These treatments primary concern to increased risk of blood clots that causes severe cardiovascular complications, including heart attacks and strokes. As a primary treatment for several health issues medicinal plants have been obliged. Improvement in numerous modern drugs and their worth has been verified that root from traditional medicine. To mitigate inflammation humans have long been hunted and thus their search has origin to the finding of several plant-derived phytochemicals that reveals major potential as inflammation reducing agents. It was emphasized from previous studies that the treatment of inflammatory diseases is done by the anti-inflammatory properties of phytomedicines with their raw isolates, pure chemicals, and M/MONPs. The aim of this study is to explore the anti-inflammatory properties of certain medicinal plants that yield a wide array of bioactive chemical with potent anti-inflammatory effects.

Keywords: Herb, Medicinal, Anti-inflammatory, Metabolites, bioactive compounds, therapeutic uses

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Introduction

History of Medicinal Plants

Medicinal plants also referred as medicinal herbs have long been used since the prehistoric times. Hundreds of different chemicals are prepared by plants which are multifunctional and of course protect plants against diseases, fungi, insects and grazing animals (Gershenzon & Ullah 2022). From being used as spices and herbs in cooking practices to counter bacterial infestation in edibles especially meat, these plants carry important medicinal significance (Tapsell et al., 2006; Spence, 2025). Certain weeds like chickweeds and dandelions were considered beneficial to health (Stepp, 2004). Plants and pollens have been discovered at different burial sites in Iraq and Morocco dating back to Paleolithic era (Sissakian, 2021). In Asia, Egyptians and Sumerians practiced the use of herbal medicines in their daily life. A paper Ebers Papyrus was discovered belonging to ancient Egyptian civilization which has 800 plants enlisted. These plants were mandrake, garlic, castor bean etc all known for their medicinal properties (Sumner, 2000; Petrovska, 2012). Different ancient cultures across Europe also knew the importance of plants as they have healing characteristics. Romans induced the usage of medicinal plants in their health practices based on the knowledge borrowed form Greeks.

2. What is Inflammation

Inflammation is a type of biological response by the body tissues when they face some harmful external stimuli like toxins, irritants, allergens, dead cells etc. Inflammation is part of innate immunity strategies in vertebrates (Janeway et al., 2001). The symptoms of inflammation include heated infected area or fever, redness and swelling of the concerned tissue, pain or body aches and anomalies in the physiology of the related tissue or organ. Inflammation acts like a physical barrier hence stopping the outspread of infection to other body cells and helps in healing. The cells involved in inflammatory response are mast cells, dendritic cells, macrophages etc. They are responsible for certain humoral secretions carrying mediators and ligands (serotonin, prostaglandins, histamine, leukotrienes).

2.1. Plant Based Anti-inflammatories

Several chemical compounds produced by plants which are placed among two groups i.e. primary and secondary secretions carrying mediators and ligands (serotonin, prostaglandins, histamine and leukotrienes) metabolites. Secondary metabolites are non-essential for their growth but help elevate their defense against different biological harms imposed by insects, bacteria, fungi and herbivorous animals. The

beneficial effects of these chemicals are not only for plants but are also known to be favorable to humans since ancient times (Adhikary & Dasgupta, 2023).

2.2. Secondary Metabolites as Anti-inflammatory Agents

There are different types of metabolites extracted from plants which act as anti-inflammatory. The target of these drugs are cyclooxygenase 1 and 2 which are the major enzymes involved in the conversion of arachidonic acid into lipid mediators hence eliminating the inflammatory response to stimuli (Bagul et al., 2005; Charles et al., 2011). Some secondary metabolites are detailed below:

2.2.1. Phenolic Compounds

Phenol carries great importance when it comes to their pharmacological roles. Some of them are anti-inflammatory such as condensed tannins, flavonoids and gallotannins. They decline the molecular availability to pro-inflammatory mediators hence inhibiting the inflammation as response (Fawole et al., 2009).

2.2.2. Flavonoids

These are polyphenols and are found usually in plant based food. Almost 4000 flavonoids have been identified and some examples are isoflavonoids, flavonlos, flavanones, catechins etc. cellular systems of mammals are greatly affected by these flavonoids in both in vitro and in vivo conditions. Their biological effects are their roles as antioxidants, anti- bacterial, anti-inflammatory, antiviral and cytotoxins (Guabiraba et al., 2010). They block inflammatory mediators and molecules (NF-KB, COX) through different routes. Dioclein is a flavonoids extracted from *Dioclea grandiflora* root which is a prominent suppressor for the mediator's production.

2.2.3. Gallotannins

Gallotannins are a really interesting group of substances. They can do quite a lot of things like fighting off viruses, combating cancer, and reducing inflammation. How they do this is by spotting free radicals, and putting a stop to inflammatory molecules like cytokines, iNOS, and COX-2. This gives them a kind of calming effect. We actually found a good amount of these gallotannins in the leaves of the protea simplex (Fawole et al., 2009).

2.2.4. Coumarins

Coumarins, a large group of naturally occurring compounds found in plants, have shown significant anti-inflammatory and antioxidant effects. This indicates their potential effectiveness in addressing issues like high-protein edema. Some coumarins have been found to target superoxide anion radicals, while others are known to inhibit the functions of lipoxygenase and cyclooxygenase, enzymes that play a role in the metabolism of arachidonic acid (Kang et al., 2009). Various coumarins, such as libanoridin (B) and columbianetin (A), have been isolated from Corydalis heterocarpa (Leal et al., 2000), and anti-inflammatory coumarins have also been recognized in other plants like Hybanthus ipecacuanha, Pterodon polygaliflorus, Justicia pectoralis, Eclipta alba, and Torresea cearensis (Küpeli et al., 2002).

2.2.5. Condensed Tannins

Proanthocyanidins, commonly referred to as condensed tannins, are compounds derived from plants that exhibit notable antioxidant and biological effects. Found in a variety of fruits, vegetables, and other plant materials, proanthocyanidins contribute to numerous health benefits, such as supporting cardiovascular health, combating cancer, and reducing inflammation. By neutralizing free radicals and regulating certain enzymes like COX enzymes, they enhance their therapeutic effects. Studies have shown the anti-inflammatory capabilities of proanthocyanidins from multiple sources, such as grape seeds, black spruce bark, and *Pyrsonima crassifolia* bark. (Guardia et al., 2001; Diouf et al., 2009; Fawole et al., 2009; Wang et al., 2011a).

2.2.6. Saponins

Saponins, glycosides derived from plants that consist of steroids or triterpenes, demonstrate significant anti-inflammatory properties. Research on saponins obtained from numerous plants reveals these effects, typically through mimicking corticosteroids or inhibiting inflammatory mediators. Notable examples include saikosaponins, ginsenosides, and glycyrrhizin. Studies have discovered potent saponins in various plants such as *Quercus imbricaria, Pithecellobium dulce, Helleborus purpurascens*, and *Polygala japonica* (Sparg et al., 2004; Wang et al., 2008). Fruticesaponin B extracted from *Bupleurum fruticescens L* (*Apiaceae*) exhibits notably strong anti-inflammatory effects. Saponins from *Bupleurum rotundifolium L* (Apiaceae) are known to reduce edema and inflammation. Aescin, derived from *Aesculus hippocastanum*, possesses vasotonic, anti-edematous, and anti-inflammatory characteristics. Additionally, a steroidal saponin found in *Agave attenuata* is effective in preventing vascular permeability. Furthermore, Loniceroside C from *Lonicera japonica* also exhibits anti-inflammatory properties (Mohammed et al., 2014).

2.2.7. Sterols

Plant membranes must contain phytosterols, which have been shown to have anti-atherosclerotic and plasma cholesterol-lowering properties. Compounds derived from these plants also contain anti-inflammatory, anti-cancer, and healthy antioxidant properties. The primary source of phytosterols, which are found in many plant species, such as Lepidium sativum and Cichorium intybus, is dietary depletion. Some phytosterols, like stigmasterol and γ sitosterol, have been identified as key ingredients with potent anti-inflammatory properties (Mohammed et al., 2014). Rare secosterols but a variety of sterols is produced by marine invertebrates. While some secosterols exhibit cytotoxic properties, *Pseudopterogorgia spp*. block protein kinase C and one of them has anti-inflammatory and antiproliferative properties (Mendes et al., 2010).

2.2.8. Terpenoids and Essential oils

Essential oils, derived from fragrant plants, contain complex compounds characterized by strong fragrances. Terpenes and terpenoids found in essential oils exhibit antimicrobial, anti-inflammatory, and analgesic properties (Al-Reza et al., 2010). Research has demonstrated the anti-inflammatory properties of essential oils from various plants, including *Zizyphus jujube* seed (Silva et al., 2003), *Lippia sidoides* (Verbenaceae) (Mendes et al., 2010), leaves of *Lippia gracilis Schauer* (*Verbenaceae*), and Eucalyptus (*Myrtaceae*) (Passos et al., 2007). These oils show promising therapeutic potential. Their properties can differ based on factors such as plant species, age, and extraction techniques (Silva et al., 2003).

2.2.9. Alkaloids

Diverse alkaloids, which include isoquinoline and indole, have tested strong anti-inflammatory properties (Fawole et al., 2009). Severe isoquinoline alkaloids including aporphine (magnoflorine), protoberberine (berberine, palmatine, jatrorrhizine, columbamine), and bisbenzylisoquinoline (berberamine, oxyacanthine, and aromoline), are determined in Turkish Berberis species (Mohammed et al., 2014). The latter's antirheumatic and anti-inflammatory effect has been used for traditional East Asian medicinal drug. The capability of bisbenzylisoquinoline alkaloids as healing marketers which could have an effect on cytokine manufacturing has been demonstrated via current studies. Drastically, tetrandrine and cepharanthine proved an anti-inflammatory response modulation (Wang et al., 2011b). Chelidonium majus having berberine and eight-hydroxydihydrosanguinarine, imperialine and chuanbeinone from Bulbus Fritillariae Cirrhosae imperialine, imperialine-β-N-oxide, isoverticine, and isoverticine-β-N-oxide from Bulbus Fritillariae wabuensis, are most of the alkaloids that have shown awesome interest (Park et al., 2011; Wang et al., 2012).

3. Plants as Natural Anti-inflammatory Agents

Innovative pharmaceuticals differ from holistic medicines in that they employ a "whole plant" approach. They rely on the combined activity of many different chemicals within the plant rather than isolating a single active component. Instead of focusing on a single specific component, these chemicals function in concert to induce several sites within composite biological pathways (Gonfa et al., 2023). Both as pure chemicals or as raw materials, medicinal plants have long been a rich source of physiologically active treatments that are widely utilized to treat a wide range of illnesses (Arif et al., 2009). The use of herbal remedies is becoming more popular due to the bad side effects and toxicity of allopathic medications. The generation of potent therapeutic mediators depends heavily on medicinal plants. Over 1.5 million people use medicinal herbs for curative, preventative, and promotional purposes as part of a traditional medical practice (Ahmed et al., 2021).

3.1. *Achillea millefoliumLinn.* (Asteraceae)

A perennial herb indigenous to Europe, *A. millefolium L.,* has a rich history of utilization in traditional medicine, particularly for its anti-inflammatory properties. For many centuries, this herb has been applied externally to address a range of skin ailments, such as burns, wounds, and skin that is irritated or inflamed, owing to its established efficacy in topical applications. The primary secondary metabolites contributing to its anti-inflammatory effects are phenolics and isoprenoids (Burk et al., 2010). Traditional medicine utilizes both aqueous and alcoholic extracts of *A. millefolium* for the treatment of gastrointestinal and hepatobiliary disorders, as well as for their anti-inflammatory properties, which may alleviate inflammation within the gastrointestinal tract. The anti-inflammatory effects of sesquiterpenes are attributed to their ability to inhibit the metabolism of arachidonic acid. The raw isolate and a flavonoid-rich fraction comprise three significant flavonoids: luteolin-7-O-glucoside, apigenin-7-O-glucoside, and rutin. Both the raw isolate and the refined components containing flavonoids and dicaffeoylquinic acids exhibit inhibitory activity against matrix metalloproteinases and human neutrophil elastase, enzymes that are involved in the inflammatory response (Benedek et al., 2007).

3.2. *Aconitum heterophyllum (*Valeraneaceae)

A. heterophyllum, widely recognized as 'Patis' or 'Ativisha' in Ayurveda, is utilized for the treatment of various conditions, including neurological disorders, fever, rheumatism, and digestive issues. The ethanolic extract derived from the roots of *A. heterophyllum* is rich in sterols, glycosides, alkaloids, and flavonoids. These compounds are known for their significant anti-inflammatory properties, likely attributed to their capacity to inhibit prostaglandin pathways. By interfering with the metabolism of arachidonic acid, the ethanolic root extract of *A. heterophyllum* may effectively reduce mild inflammation (Verma et al., 2010).

3.3. *Adhatoda vasica* (Acanthaceae)

A. vasica L., an herb indigenous to various regions and belonging to the Acanthaceae family, has been employed in traditional medical practices worldwide for several decades. It serves as a treatment for a wide range of conditions, including respiratory issues such as asthma, whooping cough, chronic bronchitis, colds, and coughs. Additionally, it is recognized for its antispasmodic, anthelmintic, and sedative expectorant properties, as well as its application in managing rheumatism and associated inflammatory edema. The herb can be administered in several forms, including fresh juice, decoction, infusion, and powder. Furthermore, it is available as syrup, liquid extract, and alcoholic extract (Claeson et al., 2000). This plant is rich in various phytochemicals, such as glycosides, alkaloids, sugars, flavonoids, terpenes, and tannins (Prajapati et al., 2003). An ethanolic extract of *A. vasica* was evaluated for its anti-inflammatory effects in albino rats using two experimental models: formalin-induced paw edema and carrageenan-induced edema. The results indicated a reduction in swelling in both models, with higher doses resulting in more significant decreases (Mulla et al., 2010).

3.4. *Bacopa monnieri* Linn. (Scrophulariaceae)

B. monnieri is a smooth, creeping xerophytic herb that establishes roots at its nodes and flourishes in wetland and muddy shore

environments (Swapna et al., 2011). Traditionally, *B. monnieri* has been utilized as a cognitive enhancer to boost concentration, focus, memory, and learning capabilities (Fuentes-Santos et al., 2022). Moreover, it has been employed in India and Pakistan as a digestive aid, cardiotonic, and to improve respiratory function, particularly in cases of bronchoconstriction (Gairola et al., 2014). In studies utilizing the carrageenan-induced rat paw edema model, *B. monnieri* demonstrated significant anti-inflammatory effects, achieving an 82% reduction in edema compared to indomethacin. Additionally, it markedly reduces the activity of the enzymes cyclooxygenase-2, 15-lipoxygenase, and 5-lipoxygenase (Viji & Helen, 2008). The strong anti-inflammatory properties of *B. monnieri* undoubtedly play a role in its effectiveness in treating various inflammatory conditions in traditional medicine (Channa et al., 2006). The inflammation-reducing effects of *B. monnieri* are likely influenced by its triterpenoids and bacosides, which have been shown to inhibit the production of pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α) and interleukin-6 (IL-6). Given the critical role these cytokines play in the inflammatory process; their reduced synthesis is essential. *B. monnieri* is recognized as an effective anti-inflammatory agent. In vitro studies involving peritoneal exudate cells and peripheral blood mononuclear cells stimulated by lipopolysaccharide (LPS) have illustrated this anti-inflammatory mechanism, which inhibits the release of pro-inflammatory cytokines. The anti-inflammatory effects of *B. monnieri* are attributed to its capacity to regulate the release of inflammatory mediators (Viji & Helen, 2011).

3.5. *Cassia fistula* L. (Caesalpiniaceae)

C. fistula, a communal tree found in Indian forests, possesses various medicinal benefits. Different parts of this plant are employed to treat jaundice, loss of appetite, inflammatory conditions, rheumatism, and skin issues. Studies on rat models for both acute and chronic inflammation have shown that extracts from the husk of *C. fistula* exhibit significant anti-inflammatory effects. Reactive oxygen species (ROS), whether generated within the body or introduced from external sources, are linked to the onset of multiple health conditions, including atherosclerosis, cancer, diabetes, arthritis, and aging. ROS play a crucial role in the progression of inflammatory diseases. In *C. fistula,* the key compounds that contribute to its anti-inflammatory properties are flavonoids and bioflavonoids (Ilavarasan et al., 2005).

3.6. *Sida cordifolia* Linn. (Malvaceae)

A member of the *Malvaceae* (mallow) family *S. cordifolia* is Vegetative subshrubs. In several regions, including New Guinea, French Polynesia, Hawaiian Islands Australia, and Africa it became habituated worldwide, it's deliberated an invasive species (SR, 2020). *S. cordifolia* is use as traditional medicine to treat numerous ailments, including inflammation of the nasal congestion, asthmatic bronchitis, blenorrhea (a discharge from the urethra or vagina), and oral mucosa (Franzotti et al., 2000). In several areas, *S. cordifolia's* has its ability to inhibit cell explosion (Jenny et al., 2005), liver regeneration (Silva et al., 2006), and its anti-inflammatory properties (Franzotti et al., 2000).

3.7. *Sesbania sesban* Linn. (Leguminosae)

Genus *Sesbania*, there are approximately 50 species out of which 33 are found in Africa most of which are annuals. Recent research has shifted its focus to perennials because annual species have been almost studied (Nigussie & Alemayehu, 2013). All of them *S. sesban* has shown demonstrated promise and this species is a small, woody stems, yellow flowers, vegetative tree characterized by linear pods (Aslan et al., 2007). Recent research specifies various compounds, including flavonoids, tannins, saponins, steroidal and terpenoidal and the anti-inflammatory activity has been identified from phytochemical exploration of crude saponin extracts. The crude saponin extract has inflammation-reducing significance confirmed by its ability to reduce carrageenan-induced edema. The swelling in both the early and later stages, suggesting an inhibition of prostaglandin release is efficiently controlled by extracts. Thus, on both the early and later stages of the inflammatory process the crude saponin extracts demonstrated anti-inflammatory properties (Dande et al., 2010).

3.8. *Ricinus communis* Linn. (Euphorbiaceae)

In tropical and subtropical regions *Ricinus communis* (castor oil plant) is an extensive plant. A methanolic extract from the plant's root explored the antioxidant and inflammation reducing properties reveled by Ilavarasan *et al.* using Wistar albino rats. The model of carrageenan-induced paw edema, significant anti-inflammatory activity shows by the extract. Free radical scavenging activity strongly exhibited by inhibiting lipid peroxidation. The existence of phytochemicals such as alkaloids, flavonoids, and tannins are detected by the extract (Ilavarasan et al., 2006).

3.9. *Phyllanthus polyphyllus* Linn. (Euphorbiaceae)

In traditional medicine in India and Sri Lanka's tropical and subtropical areas *P. polyphyllus* small shrub is employed in traditional medicine to reduce inflammation. Research revealed that the synthesis of nitric oxide and specific cytokines (TNF-α & IL-12) inhibit by four chemicals in the plant (three arylnaphthalene lignans and one benzenoid). The action of TNF-α and IL-12 clarified that *P. polyphyllus* in holistic medicine have anti-inflammatory qualities. Acute and chronic inflammatory diseases in the early phases like septic shock, asthma, arthritis, and rheumatoid are two important pro-inflammatory cytokines that are linked (Rao et al., 2006, Kumar et al., 2013).

3.10. *Thespesia populnea* (Malvaceae)

For administering splinter the leaves and bark of *T. populnea* are used to produce oil in southern India and Sri Lanka. Leaves and bark of *T. populnea* are also used as anti-inflammatory ointment for the treatment of ulcers and swellings. Studies has exposed that in both the acute and chronic inflammation model, ethanolic extract of *T. populnea* demonstrate anti-inflammatory activity. The diverse composition were all identified in the bark extract are saponins, phenols, mucilage, tannins, terpenes, carbohydrates, flavonoids, gums, alkaloids and protein during phytochemical analysis (Vasudevan et al., 2007).

3.11. *Mangifera indica* Linn. (Anacardiaceae)

In tropical and subtropical regions, *M. indica* (Mangos), and many parts of it are utilized widely in herbal medicine to treat a wide range

of illnesses (Esan et al., 2024). For a range of therapeutic purposes herbal medicine practices have utilized the *M. indica* to treat conditions like heavy menstrual bleeding, excessive vaginal discharge, bleeding hemorrhoids, and lung hemorrhages tea made from the bark or liquid extract are used. To eradicate warts on the eyelids the slag of burnt leaves is used. For diabetes, dried leaves or Powdered are used, to treat diarrhea, chronic dysentery, and gleet (a urethral discharge) a powdered and tea made from dried mango flowers are also used (Zheng et al., 2003). By using ethyl acetate and ethanol, the extracts of mango tree root retain substantial anti-inflammatory possessions, equivalent to the standard anti-inflammatory drug, diclofenac sodium (Latha et al., 2012). The chemical composition of the plant exposed flavonoids and these flavonoids have strong anti-inflammatory properties to achieve prostaglandin synthesis (Kumar et al., 2013).

3.12. *Lycopodium clavatum* Linn. (Lycopodiaceae)

L.clavatum (club moss), in ancient time uses as herbal medicine to treat wound soothing. An alkaloidal section and a number of solvents, including methanol, ethyl acetate, petroleum ether, and chloroform extracts made from aerial portions of *L. clavatum's* shows the Inflammation-reducing properties. Strong anti-inflammatory efficacy exhibited by the chloroform extract and the alkaloidal fraction using a mouse model of acetic acid-induced capillary permeability comparable to the common anti-inflammatory medication Indomethacin (Aslan et al., 2007).

3.13. *Lantana camara* Linn. (Verbenaceae)

In traditional medicine to treat tumors and cancer the aerial parts of many *lantana* species are used and the tea that is made from leaves and flowers of *lantana* is used to treat stomachaches, fever and influenza. This plant also has stated anti-diarrheal anti-malarial and anti-bacterial properties. Study reveals that aqueous extract of *L. camara* leaves have auspicious analgesic anti-inflammatory and anti-hemorrhoidal properties and is nontoxic, safe and efficient in hemorrhoids treatment (Gidwani et al., 2009).

3.14. *Garcinia mangostana* Linn. (Guttiferae)

G. mangostana fruit rinds have a long history of using it as a traditional medicine for treating skin infections and wounds. Mangosteen fruit exteriors have powerful compounds called xanthones, specifically α- and γ-mangostins. Biological effects exert by xanthones as it blocks two key enzymes that are inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2). The production of nitric oxide (NO) and prostaglandin E2 (PGE2) decreases as inflammation reduced by α- and γ-mangostins. As compare to serotonin or histamine PGE2 is a more potent inhibitor of α-mangostin (Chen et al., 2008).

3.15. *Emblica officinalis* (Euphorbiaceae)

In tropical and subtropical areas of Indonesia, Malay Peninsula, China, and India, tree *E. officinalis* has long been used as antipyretic and anti-inflammatory mediator. It was identified that plant's leaves methanol extract from the water-soluble portion keeps anti-inflammatory properties. It was investigated that the production of inflammatory intermediaries like platelet-activating factor (PAF), thromboxan and leukotriene B4e effected by this fraction. The migration of human polymorphonuclear neutrophils (PMNs) and the inhibition of this fraction demonstrate even at comparatively low concentrations. This plant has shown cardiovascular, Digestive, Dyspepsia, Hepatoprotective, Antifungal/anticandidal activity, Antimicrobial, Antiviral, Cancer, and Immune properties (Alam, 2004).

3.16. *Daphne pontica* Linn. (Thymelaeaceae)

Dating back to the 2nd century AD, with records signifying their prospective anti-cancer properties *Daphne* species have an extended history of use in herbal medicine. In the roots of *D. pontica* a flavonoid initiate Daphnodorins also known as having antitumor activity. In rheumatic pain and other inflammatory ailments numerous *Daphne* species, including *D. pontica* have also been used to heal inflammatory illnesses. Two important mediators of inflammation, interleukin-1β (IL-1β) and prostaglandin E2 (PGE2), shown by this plant as these extracts have potential to prevent there synthesis (Kupeli et al., 2007).

Conclusion

During prehistoric times, to improve all assortment of health conditions the use of phytotherapies, determined by their ease of access, affordability, cultural significance, and perceived efficiency. The evolution of innovative medications has substantial contributions made by these native plants. Folk remedies to combat inflammatory ailments a huge assortment of herbal species have been used traditionally. As persuasive anti-inflammatory agents, numerous herbal species have endured scientific scrutiny and illuminating their potential. Wide ranges of compounds such as anthraquinones polyphenols, terpenoids, flavonoids, and alkaloids, that derivative from natural sources have been identified as anti-inflammatory agent. Through methodical research various traditional remedies for rheumatism and inflammation persist uninvestigated regardless of traditional usage. It is important to identify the vigorous compounds that are accountable for anti-inflammatory effects, and develop effective formulations for treating inflammatory ailments thus traditional herbal medicines must be scientifically evaluated to regulate their pharmacological properties.

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