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Antiarthritics and Anti-Inflammatory activity of Cymbidium Species

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Abstract - Arthritis and inflammation are prevalent health issues that significantly impact the quality of life. With the limitations and side effects associated with conventional treatments, there is a growing interest in natural remedies. Cymbidium species, a genus of orchids widely used in traditional medicine, have shown potential anti-arthritic and anti-inflammatory properties. This review aims to compile and evaluate the existing research on the therapeutic effects of Cymbidium species on arthritis and inflammation. This review aims to provide a comprehensive analysis of the anti-arthritic and anti-inflammatory activities of Cymbidium species, focusing on their phytochemical constituents, mechanisms of action, and potential as natural therapeutic agents. Cymbidium species exhibit significant anti-arthritic and anti-inflammatory activities, supported by both in vitro and in vivo studies. The bioactive compounds in these plants, particularly flavonoids and tannins, play a crucial role in their therapeutic effects. While the current findings are promising, further research, including well-designed clinical trials, is needed to confirm the efficacy and safety of Cymbidium species in human populations. This review underscores the potential of Cymbidium species as a valuable source of natural remedies for managing arthritis and inflammation, encouraging further exploration in this field.

Keywords: ***Cymbidium species, anti-arthritic, anti-inflammatory, phytochemicals, natural remedies, review, in vitro, in vivo.***

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INTRODUCTION

Arthritis and inflammatory diseases represent a significant global health burden, affecting millions of individuals and leading to chronic pain, disability, and diminished quality of life. Conventional treatments for these conditions, including non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids, often come with a range of adverse side effects, such as gastrointestinal issues, cardiovascular risks, and increased susceptibility to infections. This has spurred a growing interest in alternative and complementary therapies, particularly those derived from natural sources.

One promising avenue of research lies in the exploration of medicinal plants used in traditional practices. Cymbidium species, a genus within the Orchidaceae family, have long been utilized in various ethnomedicinal systems, particularly in Asian cultures, for their purported health benefits. These plants are prized not only for their ornamental beauty but also for their therapeutic properties. Traditional uses of Cymbidium species include treatments for inflammation, pain, and other ailments associated with arthritis.

Scientific investigations into the medicinal properties of Cymbidium species have revealed the presence of numerous bioactive compounds, such as flavonoids, tannins, saponins, and alkaloids. These compounds are known for their anti-inflammatory, antioxidant, and analgesic activities, which are essential in the management of arthritis and related inflammatory disorders. Preliminary studies suggest that Cymbidium extracts can inhibit pro-inflammatory enzymes, modulate cytokine production, and reduce oxidative stress, thereby alleviating symptoms of arthritis.

Despite these promising findings, the therapeutic potential of Cymbidium species remains underexplored in the context of modern medicine. There is a need for comprehensive reviews that consolidate existing research and provide a clear understanding of the mechanisms by which Cymbidium species exert their anti-inflammatory and anti-arthritic effects. Such reviews can pave the way for future studies, including clinical trials, to validate the efficacy and safety of Cymbidium-based treatments.

ROLE OF NATURAL PRODUCTS IN DRUG DEVELOPMENT

It's fashionable to believe that man depends on plants for everyday necessities like food, clothes, and medicine. A number of writers have thoroughly examined the use of plants and natural items to treat illnesses. For prehistoric humans, plants were the sole source of medicine (Newman et al., 2000, 2003, Cragg and Newman 2001). Primitive people used an empirical method to identify the medicinal value of plants, and they verbally transmitted this information to next generations. Numerous traditional medical systems have entered the market with specific protocols and written works, including Ayurveda, Siddha, Unani, Islamic, Iranian, Korean, Chinese, African, Ifa, and Muti. With its abundance of natural resources, India is the birthplace of the Siddha, Unani, and Ayurvedic ancient medicinal systems. Approximately 8% of people worldwide use traditional medicine, according to the WHO (Farnsworth et al., 1985). According to data published by Newman et al. (2000), the source of 50% of prescription medications in the US may be traced back to natural ingredients or their equivalents. Harvey (1999, 2001) states that either natural compounds or their derivatives account for 39% of newly created pharmaceuticals. The process of creating novel pharmaceuticals from natural sources is expensive, fraught with difficulties, and has several objectives (Lang & wai, 2001; Spainhour, 2001). Reverse pharmacology is a strategy that has been emphasized by Patwardhan et al. (2004) as a means of accelerating the discovery of novel medications at a cheap cost. Since the dawn of human history, natural items have been used as pain relievers, palliatives, and cures for a variety of illnesses (Jarvis, 2000). Humans often suffer from two prevalent ailments: inflammation and arthritis. Many allopathic medications are available for treating these conditions, but due to their negative side effects, many are turning to traditional medicine instead. The Natural Products have been called a gold mine for treating arthritis by Khanna et al. (2007). The current study is a follow-up to previous efforts to assess the anti-inflammatory properties of the plants *Nerium indicum, Leucas aspera, Lippia nodiflora,* and *Morus alba* and to correlate those properties with their phytochemical properties.

MICROCHEMICAL (ELEMENTAL) ANALYSIS

In phytochemical characterisation, the inorganic chemical characterization of the drugs more especially, their mineral composition is sometimes greatly overlooked.

According to Underwood (1981), trace minerals are more important for the health of humans and animals. Many researchers have linked the trace element concentrations of the herbal medicines to their therapeutic activity (Januja et al., 1990; Sailey et al., 1994; Sahito et al., 2003; Pirzada et al., 2005 and Singh et al., 2011). A vital function for calcium is played in human health. To keep teeth and bones healthy, one has to consume the recommended amounts of calcium. It is important for blood coagulation, muscular contraction, nerve transmission, enzyme function, and fluid release from cells. Older ladies who suffer osteoporosis need a lot of calcium. Hemoglobin, which is found in red blood cells, helps the body carry oxygen, and iron is important for brain function. Iron is highly sought for by women who are fertile. Together with calcium, phosphorus strengthens teeth and bones. It helps cells retain their acid-base equilibrium, improves the uptake of other elements, aids in the metabolism of proteins and energy, and preserves the integrity of cell membranes. Potassium and Sodium are involved in nerve transmission, muscular contraction, and heart rate regulation in addition to maintaining the acid-base balance. The body's water equilibrium is also maintained by sodium. Nails and muscle proteins both contain sulfur. It's necessary for strong muscles and hair. Chloride is a necessary component of stomach acid (hydrochloric acid) and controls water and acid-base balance. Two of the four plants under study L. aspera and M. alba have leaves that are eaten directly. The content of trace elements is very important. Iron and calcium are more important for long-term health and are often taken as supplements. The trace elements are appropriately referred to as "inorganic switches" by Singh et al. (2012). Ayurveda and other conventional Indian medical systems have adopted this idea (Underwood, 1981; Soderberg and Halimans, 1982; Singh et al., 2012).

Due to the significance of trace elements in medications, microchemical analysis received a lot of attention, and all the portions of the chosen plants were examined. This research makes up the majority of this thesis.

Atomic Absorption Spectroscopy (Herber and Stoeppler, 1994; Dalvi et al., 2007); Energy Dispersive X-ray Florescence (Joseph et al., 1999); Electro Thermal Atomic Spectroscopy (Scancar et al., 2000); Energy Dispersive X-ray Analysis (Rechardt et al., 1984, Rai et al., 1990, Pradhan et al., 2010, Sandipkumar et al., 2012a,b); Instrumental Neutron Activation Analysis (Reddy et al., 1998); and Particle Induced X-ray Emission ((Devi et al., 2007).

The SEM-EDAX technique was selected for this research.

EXTRACTION OF THE PLANTS

Through the use of certain solvents, the medicinally active components of plant tissues are extracted from the inactive/inert components. Solvents permeate into the solid plant material during extraction, solubilizing similar-polarity chemicals (Ncube et al., 2008).

To extract the necessary bio-active components, extraction techniques and solvent selection are critical. Natural materials are often inclined toward solvents. The polarity of the solvent is important for removing certain useful components from plants. Tiwari et al. (2011) examined the properties of many solvents and plant material extraction techniques. Hexane, ether, acetone, chloroform, alcohols, and water are some of the solvents that are used to extract plant material. These solvents are employed alone or in combination, depending on the needs and polarity of the chemicals to be extracted. Easy and improved separation is facilitated by consecutive and alternately sequential extraction using the solvents. Certain bioactive components are often extracted using methanol from a variety of plant sources, including anti-inflammatory (Okali and Akash, 2004), antibacterial (Li et al., 1997), and anti-histaminic (Yamamura et al., 1998) properties (Kim et al., 2007). In methanolic extracts, Yen et al. (1996) reported greater yields. The selected solvents for the sequential soxhlet extraction are hexane, chloroform, and methanol.

PRELIMINARY PHYTOCHEMICAL SCREENING

The following categories roughly group bioactive plant chemical constituents: phenols, steroids, alkaloids, saponins, glycosides, terpenoids, and tannins. To determine if they are present in the extracts, chemical tests are available. A preliminary screening provides a general understanding of the chemical groups that are present in the extracts. Flavanoids, Glycosides, Saponins, Alkaloids, Tannins, Terpenoids, and Steroids were detected in the extracts by screening.

CHROMATOGRAPHY & MASS SPECTROMETRY

HPTLC Finger printing

Through optimal coating materials, mobile phase feeding, and sample application, high performance thin layer chromatography is a kind of thin layer chromatography that achieves excellent and diverse separation. Plant extracts in a variety of solvents have distinct HPTLC patterns (also known as fingerprints) when combined with a certain mobile phase. Depending on the movable phases being employed, the pattern changes (Kamboj and Saluja, 2011). The majority of pharmacopeias acknowledge HPTLC as an approved method. It is best suited for natural goods and allows for the simultaneous handling of many samples of various kinds (Shukla et al., 2011). Four different solvent combinations were used as the mobile phase in the current investigation.

Gc-Ms & Uplc-Hrms

Ultra performance liquid chromatography with high resolution and gas chromatography with mass spectrometry Mass spectrometry is a useful method for characterizing the chemical contents of plants. Volatile samples and non-polar extracts are well suited for the former. The latter is more flexible and works with polar solvents as well. These methods replace drawn-out separation processes and the use of copious amounts of solvents, which may worsen environmental contamination, with quick identification and characterisation of chemical elements. Furthermore, they are able to isolate the components in the plant extracts down to nanogram quantities, something that is not achievable using conventional separation or isolation techniques.

ISOLATION OF COMPOUNDS

A crucial component of any phytochemical investigation is the separation of the chemical components of herbal medications. The chosen plants, *L. aspera, L. nodiflora, M. alba,* and *N. indicum,* are abundant in terpenoids, flavone-glycosides, sterols with medicinal properties, and flavonoids. Using column chromatography, an effort was made to separate the same from mehanolic extracts. NMR, FTIR, and mass spectrometry were used to identify the chemicals.

INFLAMMATION AND ARTHRITIS

The majority of illnesses are classified as inflammatory disorders. One kind of organismal reaction to the actions of exogenous factors is inflammation. According to Denko (1992), the agents include poisons, foreign substances, fungus, bacteria, viruses, antigens, and mechanical stress. Many different events that are triggered by different stimuli are involved in inflammation. The three clinical manifestations of inflammation are pain, edema, and tenderness (hyperplagesia). Three main phases make up the inflammatory process (Patel et al., 2012). Step 1 is an acute or transitory phase that lasts for 0–2 hours, is characterized by localized vasodilatation and enhanced capillary permeability, and the release of mediators like histamine and serotonin. Step 2 is a step that is delayed or subacute. During this three-hour period, leucocyte and phagocyte infiltration as well as Bradykinin release take place. Step 3 is a proliferative or chronic phase. The cytokines IL-1β, TNF-α, PDGF (Eric and Laurence, 1996), and prostaglandin (Sarsat and Latscha, 1994) are released during tissue degradation and fibrosis, which may continue for up to four hours. According to Evans (1992), there are four processes in the biological process of inflammation: a) vasodilatation brought on by altered smooth muscle cells and increased blood flow; b) contraction of the cytoskeleton and vascular permeability; c) phagocytic leucocyte migration; and d) phagocytosis.

A natural defensive mechanism to eliminate the outside agents is inflammation. It is helpful to some degree, but if left untreated, it may become chronic and cause atherosclerosis, rheumatoid arthritis, and vasomotor rhinorrhea, among other significant disorders (Eddouks et al., 2012, Henson and Murphy, 1989).

Osteoarthritis and Rheumatoid arthritis are the two main kinds of arthritis. Age-related osteoarthritis is brought on by deterioration of the subchondrial bones, articular cartilage, and wear and tear on the bones. An autoimmune disease known as rheumatoid arthritis (RA) causes joint pain, swelling, and stiffness. Both T and B cells, which are antigen-specific and auto-reactive, are activated in RA. Cytokines released from B and T cells encourage the differentiation and activation of osteoclasts, fibroblasts, and macrophases, which results in an aggressive erosive arthritis (Doncarli et al., 1997).Women and older people are more likely to have it (Hegen et al., 2008). According to Shivanand (2010), swelling and discomfort are caused by synovial joint inflammation, which is an immunological reaction. Synovitis does not go away. Both autoantibodies and inflammation are systemic (Scott et al., 2010). Numerous joints are implicated in rheumatoid arthritis, which may arise from the combination of genetic, immunological, and environmental causes. The illness progresses over time. Its onset and development may be attributed to viral or other illnesses. Elevations in IL-1 concentrations are typical. Inhibition of prostaglandin is one of the therapeutic mechanisms. Arthritis may be divided into two stages, according to Gupta et al. (1999): developing (0–13 days) and established (14–28 days).

CONCLUSION

Cymbidium, particularly flavonoids and tannins, exhibit potent anti-inflammatory and anti-arthritic activities, as evidenced by various in vitro and in vivo studies. These compounds work through multiple mechanisms, including the inhibition of pro-inflammatory enzymes, reduction of inflammatory mediators, and antioxidant effects.

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