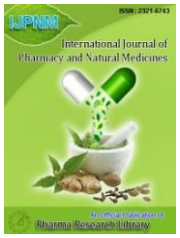

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Phytochemical Screening and Anti-Arthritic activity of *Cymbidium* species

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A B S T R A C T

The aim of the present study is to explore about the phytochemical and antiarthritic potential of properties *Cymbidium devon odyssey* and *Cymbidium Sarah Jean*. Both qualitative and quantitative analyses of ethanol, methanol, chloroform, and aqueous extracts of leaves were conducted, revealing the presence of steroids, terpenoids, tannins, flavonoids, alkaloids, glycosides, saponins, and carbohydrates. Additionally, the anti-arthritic potential of these plants was evaluated, indicating their ability to inhibit protein denaturation a key factor in rheumatoid arthritis pathogenesis suggesting their use in mitigating autoantigen production. The findings contribute a novel phytochemical profile for these species and highlight their potential therapeutic applications. While promising, the study acknowledges limitations such as low extract yield, high cost of solvents, and technical challenges in extraction. Future research should focus on in-vivo studies, high-throughput screening of individual phytocompounds, and exploration of synergistic effects of combined plant extracts for enhanced antimicrobial and anti-inflammatory efficacy.

Keywords: *Cymbidium devon odyssey*, *Cymbidium Sarah Jean*, Phytochemical screening, antimicrobial activity, Anti-arthritic activity, Ursolic acid, Protein denaturation.

A R T I C L E I N F O

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C o n t e n t s

1. Introduction

Rheumatoid arthritis (RA) is a chronic, heterogeneous autoimmune disorder primarily marked by persistent inflammation of the synovial joints, progressive destruction of synovial membranes, and narrowing of joint spaces. These pathological changes significantly impair joint function and mobility. RA can develop at any age, though it is more prevalent in women than men [1,2]. As a systemic condition, RA typically affects multiple joints including those in the hands, feet, wrists, knees, and ankles and is often accompanied by a range of symptoms such as fatigue, joint pain, swelling, redness, tenderness, stiffness, numbness, tingling, and unintentional weight loss [3].

Both genetic predispositions and environmental exposures have been identified as risk factors contributing to the onset of RA. The disease not only causes articular damage but

also leads to comorbidities that may impact several physiological systems, such as bone integrity, psychological health, and metabolic processes [4]. Beyond physical debilitation, RA negatively influences health-related quality of life (HRQOL) and is associated with increased mortality rates. The overall disease burden is substantial, with indirect costs including lost work productivity estimated to be four times greater than direct medical expenses. In the United States alone, the annual economic burden of arthritis including RA is approximately $303.5 billion, accounting for both healthcare costs and reduced productivity [5–7].

RA affects around 5 per 1,000 individuals and can lead to significant joint destruction and disability if not managed effectively [8]. Over the last twenty years, major strides have been made in understanding the disease's pathophysiology, identifying reliable clinical outcome measures, and developing effective treatment protocols, including the emphasis on early diagnosis and intervention.
In Pakistan, rheumatology remains an emerging medical specialty, with limited access to specialized clinical services and few practicing board-certified rheumatologists. The available research on RA within the Pakistani population is scarce, yet valuable in enhancing our understanding of autoimmune diseases in the region. Current estimates suggest a national RA prevalence rate of approximately 5.5%. A study conducted in Karachi reported an RA incidence of 12.9% among 4,900 participants, highlighting a notably higher prevalence in females [9–11].

The primary goals of rheumatoid arthritis (RA) treatment are to alleviate pain, control inflammation, and minimize disability associated with the disease. Currently, RA is managed using conventional allopathic medications, including corticosteroids such as hydrocortisone, betamethasone, and dexamethasone, as well as disease-modifying anti-rheumatic drugs (DMARDs) like methotrexate, cyclosporine, azathioprine, and sulfasalazine. Non-steroidal anti-inflammatory drugs (NSAIDs), including diclofenac sodium, ibuprofen, mefenamic acid, and piroxicam, are also widely prescribed to reduce inflammation and provide symptomatic relief. However, the long-term use of these drugs is associated with significant adverse effects. Prolonged NSAID usage can lead to renal impairment, liver dysfunction, and an increased risk of cardiovascular complications. Additionally, gastrointestinal issues such as gastritis, bloating, gastric ulcers, and internal bleeding are common side effects [12]. These challenges have emphasized the urgent need to explore alternative therapeutic strategies particularly from natural sources that offer effective disease management with fewer side effects and improved safety profiles.

Cymbidium aloifolium, commonly referred to as the aloe-leafed cymbidium, is an orchid species native to various regions across Asia. It typically grows in tropical and subtropical forests at altitudes ranging from 300 to 2000 meters above sea level. The plant thrives under both epiphytic and lithophytic conditions, often attaching itself to trees or rocks in its natural environment.

The phytochemical profile of *C. devon* reveals a diverse range of bioactive secondary metabolites, including alkaloids, flavonoids, phenolics, saponins, tannins, and glycosides. Notably, alkaloids such as hordenine and cymbidine have been identified in this species and are recognized for their antimicrobial and analgesic effects [13]. In addition to its phytochemical richness, *C. devon* exhibits a wide spectrum of pharmacological activities, including antimicrobial [14], antioxidant, anti-inflammatory, and anticancer properties [15].

2. Materials and Methods

Collection of plant material:

The plant material of *Cymbidium devon odessey* and *Cymbidium Sarah Jean* was gathered from Tirumala Hills, Tirupati and was identified and authenticated by Dr. K. Madhava chetty, Assistant Professor, S V University, Tirupati.

Extraction of Plant Material

Leaves of *Cymbidium devon odessey* and *Cymbidium Sarah Jean* were cut into little pieces using sterile scissor, washed under running tap water to remove the dust impurities. Then the plant leaf was dried at room temperature (under shade). After complete drying, it was powdered using the motor and pestle.

Around 100gm of air-dried powdered plant material was removed in soxhlet device with distinctive dissolvable, starting form ethanol, then methanol, chloroform and aqueous for both the plants leaves of Cymbidium devon odessey and *Cymbidium Sarah Jean.*

Every time before removing with next dissolvable, powdered material was air dried beneath 100oc. The extracted solvent was evaporated using the water bath at 100oC. After the evaporation the extracted samples were stored in cold for further analysis.

Preparation of plant extract:

Quantitative and quantitative properties of the plant's herbs have been studied for studying its various properties. This will help in the setting up of standard of new drugs in the market. Examination is done to check for the primary and secondary metabolites present in the plant's species. Couple of dynamic phytochemicals from these herbs has envisioned some high advancement profile drugs. Plant constituent's major parts in human life. Various plants metabolites have various metabolic activities such as antimicrobial and anti-arthritic activities. Plant derived things are of major use in phyto-constitution since ancient times. Plants various parts such as bark, leaves, blooms, roots, typical things, and seeds can be used for the study of new products. Plant parts contain discretionary metabolites. Phytochemical processing and screening of plants have to be used for different documentation and studies. (Mojab et al., 2003; Parekh and Chanda, 2007b; Parekh and Chanda, 2008).

Phytochemical screening

Phytochemicals Screening of plants Leaves of *Cymbidium devon odessey* and Cymbidium Sarah Jean. To the best of my knowledge till date there has been no studied performed on phytochemical screening of this species. Phytochemical

screening activity of *Cymbidium devon odessey* and Cymbidium Sarah Jean was carried out to analyse the presence of the following compounds present in the plants.

In-vitro Antiarthritic activity

Invitro Antiarthritic studies with the extracts using different dosage forms of the two plants were initiated. *Cymbidium devon odessey*, and *Cymbidium Sarah Jean* were chosen for the present examination to check the antiarthritic adequacy according to the writing study. The shade dried powders of *Cymbidium devon odessey*, and *Cymbidium Sarah Jean* were prepared to get methanolic and hot fluid concentrates utilizing soxhlet extraction strategy. The methanol and fluid concentrates of *Cymbidium devon odessey*, and *Cymbidium Sarah Jean* which were acquired after Soxhlet extraction were oppressed for phytochemical examination to discover the dynamic mixes and the nearness of alkaloids, flavonoid, starch, saponins, steroids, triterpenoids and tannins. The starter phytochemical examination of methanolic removes and fluid concentrate indicated noteworthy impact on dynamic constituent is liquor dissolvable concentrate, water solvent concentrate. The above examinations were the real piece of phytoconstituents assessment to recognize essential parts of the plants. The natural plant remove contains mix of two plants *Cymbidium devon odessey*, and *Cymbidium Sarah Jean*as two proportions of methanolic and fluid plant extricates and powdered rough medications in the measurements type of cases.

3. Results and Discussion

Table 1: Phytochemical screening of *Cymbidium devon* and *Cymbidium devon*

Sr No.	Phytoconstituent	Test	*Cymbidium devon* Observations	*Cymbidium Sarah* Observations
1	Alkaloid test	Mayers test	Positive	Positive
2	Flavonoid test	Alkaline reagent test	Positive	Positive
3	Phenolic content	Sodium hydroxide test	Negative	Negative
4	Tannin content	Ferric chloride test	Negative	Negative
5	Steroid test	Salkowski's test	Positive	Positive
6	Carbohydrate	Benedict's Test	Positive	Positive
7	Triterpenoids	Salkowski's test	Positive	Positive
8	Saponin test	Saponin test	Positive	Positive
9	Glycosides	Glycosides test	Positive	Positive

In-vitro anti-arthritic activity:

Methanol Extract of *Cymbidium Devon odessey*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000

Absorbance of test = 0.0227

Absorbance of control = 0.0062 Absorbance of product control = 0.0189

Formula:

$$\% \text{ Inhibition} = \frac{(\text{OD of test} - \text{OD of product control})}{\text{OD of control}} \times 100$$

Calculations: $= \frac{\mathbf{100\ (0.0227 - 0.0189)}}{\mathbf{0.0062}} = \mathbf{61.29\%}$

Ethanol Extract of *Cymbidium Devon odessey*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000

Absorbance of test = 0.0157

Absorbance of control = 0.0097 Absorbance of product control = 0.0071

Formula:

$$\% \text{ Inhibition} = \frac{(\text{OD of test} - \text{OD of product control})}{\text{OD of control}} \times 100$$

Calculations: $= \frac{\mathbf{100\ (0.0157 - 0.0071)}}{\mathbf{0.0097}} = \mathbf{88.66\%}$

Aqueous Extract of *Cymbidium Devon odessey*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000

Absorbance of test = 0.0157
Absorbance of control = 0.0181
Absorbance of product control = 0.0110

Formula:

% Inhibition= (OD of test – OD of product control) x 100
OD of control

Calculations: **=100 (0.0157- 0.0110) = 25.97%**
0.0181

Antiarthritic activity of *Cymbidium Sarah Jean*

Methanol Extract of *Cymbidium Sarah Jean*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000
Absorbance of test = 0.0378
Absorbance of control = 0.0097
Absorbance of product control = 0.0277

Formula:

% Inhibition==(OD of test – OD of product control) x 100
OD of control

Calculations:

= 100 (0.0370- 0.0277) = 95.88%
0.0097

Ethanol Extract of *Cymbidium Sarah Jean*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000
Absorbance of test = 0.0370
Absorbance of control = 0.0097
Absorbance of product control = 0.0283

Formula:

% Inhibition= (OD of test – OD of product control) x 100
OD of control

Calculations: **= 100 (0.0370 - 0.0283) = 89.69%**

0.0097

Aqueous Extract of *Cymbidium Sarah Jean*

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000
Absorbance of test = 0.0384
Absorbance of control = 0.0129
Absorbance of product control = 0.0333 **Formula:**

% Inhibition= (OD of test – OD of product control) x 100
OD of control

Calculations: **=100 (0.0384- 0.0333) =39.53%**
0.0129

Antiarthritic activity of standard Diclofenac sodium

Concentration -1mg/ml

Observations:

Absorbance of Blank = 0.000 Absorbance of test = 0.0658 Absorbance of control = 0.0147 Absorbance of product control = 0.0474

Formula:

% Inhibition= (OD of test – OD of product control) x 100
OD of control

Calculations:

= 100 (0.0600- 0.0474) =85.71 %
0.0147

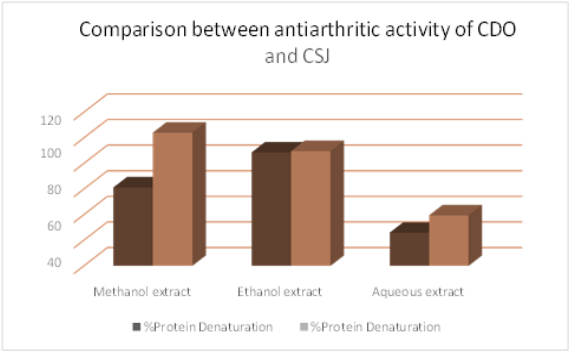

Figure 1: Comparison between antiarthritic activity of CDO and CSJ

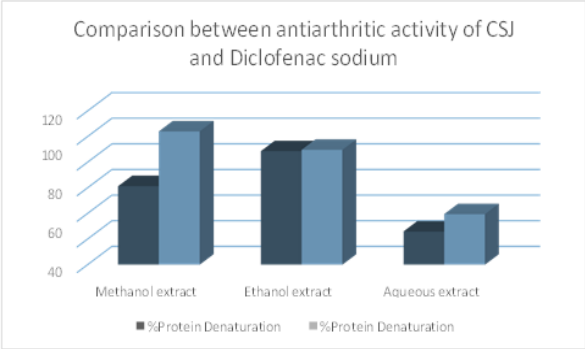

Figure 2: Comparison between antiarthritic activity of CSJ and Diclofenac sodium

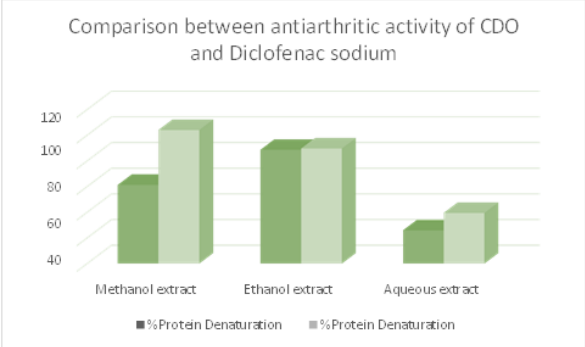

Figure 3: Comparison between antiarthritic activity of CDO and Diclofenac sodium

4. Conclusion

Since ancient times, particularly in India and China, plants have played a crucial role in traditional medicine systems for managing various health conditions and improving overall well-being. Long before the development of synthetic drugs, herbal remedies were the primary means of treating diseases. However, the rise of allopathic medicine led to a decline in the use of traditional plant-based treatments. With growing awareness of the limitations and side effects of synthetic drugs, interest in herbal medicine has resurged globally. Traditional systems like Ayurveda, Unani, and Chinese medicine rely heavily on phytomedicines plant-derived products with therapeutic potential. Despite technological advancements in the West, many developing countries still depend on herbal treatments for primary healthcare needs. WHO estimates that about 70% of the population relies on traditional medicine. Phytotherapy, or the use of plant-based compounds, is a multidisciplinary field involving ethnopharmacology, phytochemistry, and toxicology. However, development of herbal drugs faces challenges like lack of patent protection, harmonization of quality standards, and regulatory hurdles. Clinical validation and standardization are key for the future of phytomedicine. In the present study, phytochemical profiling of *Cymbidium devon odyssey* and *Cymbidium Sarah Jean* was conducted using various solvent extracts. Qualitative and quantitative analyses confirmed the presence of significant secondary metabolites such as flavonoids, alkaloids, tannins, and terpenoids. These compounds are believed to contribute to the anti-inflammatory and anti-arthritic properties of the plants. The study demonstrated that these Cymbidium species may inhibit in vivo protein denaturation, a key factor in the pathogenesis of rheumatoid arthritis. This supports their traditional use in inflammation-related disorders and highlights their potential in developing plant-based anti-arthritic therapies.

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