Medicinal plants of anti-arthritic potential: A review

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Abstract

Rheumatoid arthritis (RA) is a chronic inflammatory condition of the connective tissues throughout the body, but especially around the joints. RA is the most common inflammatory arthritis and affects about one percent of the population. RA affects three times more women than men. This is a long lasting disease that can affect joints in any part of the body, most commonly the hands, wrists, and knees. Popularity of medicinal plants is increasing day by day due to side effects of allopathic medicines. The present review will become a beneficial tool for the mankind who totally depends upon the herbal medicines.

Key word: Anti-arthritic Activity, Anti-inflammatory Activity, Momordica charantia, Karela.

Introduction

Arthritis means joint inflammation; it is a chronic, progressive and disabling autoimmune disease. Arthritis can progress very rapidly causing swelling and damaging cartilage and bone around the joints. Any joint may be affected but it is commonly at the hands, feet and wrists\textsuperscript{1}. Rheumatoid arthritis (RA) is a chronic, systemic inflammatory disease predominantly affecting the joints and periarticular tissue. RA still remains a terrifying disease\textsuperscript{2}. RA this is an inflammatory form of arthritis the synovial membrane (synovial) is attacked resulting in swelling and pain\textsuperscript{3}.

The regulation of these mediators secreted by macrophages and other immune cells\textsuperscript{4} and modulation of arachidonic acid metabolism by inhibiting enzymes like COX and LOX are the potential target for chronic inflammatory conditions\textsuperscript{5}. Its prevalence depends upon age. It occurs more frequently in women than in men. It is an inflammation of synovial joint due to immune mediated response. All anti-inflammatory drugs are not anti arthritic because it does not suppress T-cell and B-cell mediated response. Epidemiological studies overall show a female to male ratio of about 3:1. There are many class of anti-arthritic drugs are available like NSAIDS, Monoclonal antibodies, uricosuric agents, gold compounds, anti-cytokine, immunosuppressant like glucocorticoids, etc. But this all class of drugs is responsible for symptomatic relief.
The pain from arthritis is due to inflammation that occurs around the joint, damage to the joint from disease, daily wear and tear of joint, muscle strains caused by forceful movements against stiff painful joints and . Arthritis is an auto immune disorder 6-9.

Figure 1: Joint Status in Rheumatoid arthritis

Herbal source of Anti-arthritic activity

Table 1: Herbal drugs showing Anti-arthritic activity

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Family</th>
<th>Part of plant</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Abrus prectarius</em></td>
<td>Gunja</td>
<td>Papilionaceae</td>
<td>Leave</td>
<td>FCA</td>
</tr>
<tr>
<td>2</td>
<td><em>Acacia catechu</em></td>
<td>Willd</td>
<td>Mimosaceae</td>
<td>Root</td>
<td>FCA</td>
</tr>
<tr>
<td>3</td>
<td><em>Acalypha indica</em></td>
<td>Khokali</td>
<td>Euphorbiaceae</td>
<td>Root</td>
<td>Inhibition protein denaturation</td>
</tr>
<tr>
<td>4</td>
<td><em>Achyranthes aspera</em></td>
<td>Linn</td>
<td>Amaranthaceae</td>
<td>Seed</td>
<td>Inhibition protein denaturation</td>
</tr>
<tr>
<td>5</td>
<td><em>Asystasia Dalzelliana</em></td>
<td>Neelkanth</td>
<td>Acanthaceae</td>
<td>Leave</td>
<td>FCA</td>
</tr>
<tr>
<td>6</td>
<td><em>Boswellia serrata</em></td>
<td>Salallai</td>
<td>Burseraceae</td>
<td>Whole plant</td>
<td>CFA</td>
</tr>
<tr>
<td>7</td>
<td><em>Bauhinia variegata</em></td>
<td>L.</td>
<td>Fabaceae</td>
<td>Leave</td>
<td>FCA</td>
</tr>
<tr>
<td>8</td>
<td><em>Cassia uniflora</em></td>
<td>Senna</td>
<td>Caesalpiniaceous</td>
<td>Stem</td>
<td>CFA</td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Uniflora</td>
<td>Family</td>
<td>Part(s)</td>
<td>Model(s)</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------</td>
<td>----------</td>
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<td>----------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Curcuma longa L.</td>
<td>Turmeric</td>
<td>Zingiberaceae</td>
<td>Rhizomes</td>
<td>CIA</td>
</tr>
<tr>
<td>10</td>
<td>Desmodium gangeticum L.</td>
<td>Dhurva</td>
<td>Fabaceae</td>
<td>Root, Arial part</td>
<td>CIPO</td>
</tr>
<tr>
<td>11</td>
<td>Elaeocarpus Sphaericus</td>
<td>Rudraksha</td>
<td>Elaeocarpaceae</td>
<td>Fruit</td>
<td>FCA</td>
</tr>
<tr>
<td>12</td>
<td>Euphorbia Antiquorum Linn</td>
<td>Malayan</td>
<td>Euphorbiaceae</td>
<td>Plant</td>
<td>Hot Plate</td>
</tr>
<tr>
<td>13</td>
<td>Elaeocarpus Serratus Linn</td>
<td>Veralu</td>
<td>Elaeocarpaceae</td>
<td>Leaf, Seed</td>
<td>Inhibition Protein denaturation</td>
</tr>
<tr>
<td>14</td>
<td>Ficus bengalensis</td>
<td>Bargad</td>
<td>Moraceae</td>
<td>Stem bark</td>
<td>FCA, FIA, AIA</td>
</tr>
<tr>
<td>15</td>
<td>Ichnocarpus frutescens</td>
<td>Black creeper</td>
<td>Apocynaceae</td>
<td>Root</td>
<td>HRBC, Protein denaturation</td>
</tr>
<tr>
<td>16</td>
<td>Merremia Emarginata Burm</td>
<td>Kupit-Kup</td>
<td>Convolvulaceae</td>
<td>Whole plant</td>
<td>FCA</td>
</tr>
<tr>
<td>17</td>
<td>Pluchea lanceolata</td>
<td>Rasana</td>
<td>Asteraceae</td>
<td>leaf, stem, root and callus</td>
<td>Inhibition Protein denaturation and HRBC</td>
</tr>
<tr>
<td>18</td>
<td>Thunbergia grandiflora Roxb</td>
<td>Blue skyflower, Bengal clockvine</td>
<td>Acanthaceae</td>
<td>Leave</td>
<td>HRBC</td>
</tr>
<tr>
<td>19</td>
<td>Trichodesma indica Linn</td>
<td>Indica borage</td>
<td>Boraginaceae</td>
<td>Leave</td>
<td>CIPO</td>
</tr>
<tr>
<td>20</td>
<td>Wedelia calendulacea L.</td>
<td>Chinese wedelia</td>
<td>Asteraceae</td>
<td>Leaves</td>
<td>CFA</td>
</tr>
</tbody>
</table>

FCA or CFA- Freunds adjuvant arthritis model (FAC), Carrageenan-induced paw oedema model (CIPO), Streptococcal cell wall-induced arthritis, Collagen Type II Induced Arthritis (CIA) Formaldehyde Induced Arthritis (FIA), Complementary Alternative Medications (CAMs), Aureus-induced septic arthritis (AIA), Inhibition of protein denaturation, HRBC (Human red blood cell)

**Acalypha indica Linn.**

*Acalypha indica* methanol extract was evaluated using three different *in vitro* models to explore antiarthritic potential such as inhibition of protein denaturation, proteinase inhibitory action and antihyaluronidase activity. The concentrations of 10 to 200 μg/ml of *A. indica* methanol extract were prepared using DMSO. Diclofenac was used as the positive control. All *in vitro* determinations were done in triplicate. A dose dependent increase in percentage inhibition was observed for all the three models. The inhibitory concentration (IC50) was found to be 52 μg/ml for protein denaturation assay, 37 μg/ml in proteinase inhibitory action and 18 μg/ml for anti-hyaluronidase activity. Diclofenac offered protective activity at even much lower concentrations compared to *A. indica* methanol extract producing IC50 values of 40 and 13 μg/ml for protein.
denaturation and proteinase inhibitory assays. A. indica exhibited a very good anti-arthritic activity in all the methods checked confirming its traditional use 30.

**Asystasia dalzelliana**
Anti-arthritic activity of ethanolic extract of *Asystasia dalzelliana* leaves was evaluated by Freund’s adjuvant induced arthritis model in rats. Paw edema, changes in organ weight, serum parameters such as SGOT, SGPT and ALP were estimated. Hind paw of experimental rats were also subjected for radiographic and histopathological examination for assessing the anti-arthritis potential of ethanolic extract of *A. dalzelliana* leaves. The results of the current investigation concluded that extract of dose of 800mg/kg possess a significant anti-arthritic activity than the lower doses of 200mg/kg and 400mg/kg. The observed anti-arthritis activity of extract may be due to the presence of phytoconstituents such as alkaloid and flavonoids. 14 *A. dalzelliana* for its possible anti-arthritic activity by HRBC membrane stabilization and inhibition of protein denaturation method was evaluated. Methanolic extract upon the column chromatography yielded five fractions named (AD-01, AD-02, AD-03, AD-04, AD-05) and were screened for their anti-arthritic activity. Among the five fractions tested, AD-3 and AD-4 shown good anti-arthritic activity when compared with standard Diclofenac sodium. The maximum membrane stabilization of AD-3 and AD-4 fraction was found to be at 71.64% and 94.68% (average) respectively. The protein denaturation inhibition of AD-3 and AD-4 fraction was found to be 52.84% and 64.56% respectively. Therefore, the studies supported the use of active constituents from *Asystasia dalzelliana* leaves in treating rheumatoid arthritis 31.

**Bauhinia variegata** L.
The anti-inflammatory activity of the leaf extract of *B. variegata*, using three in vivo animal models: the carrageenan induced rat paw edema, cotton pellets induced granuloma formation, and adjuvant induced arthritis in rat was evaluated. Both the ethanol extract and the petroleum ether fraction obtained from this extract demonstrated activity in all the three bioassays. The activity was found to be more pronounced in the petroleum ether fraction. These bioactivities compared favorably with diclofenac sodium, which was used as positive control, and confirms the traditional usefulness of this plant for the treatment of both acute and chronic inflammatory conditions 16.

**Curcuma longa** Linn.
In this study, collagen-induced arthritis (CIA) model was utilized to study the effects of curcumin on joint inflammation in Sprague-Dawley rats. Body weight measurement, arthritis score assessment and radiology score assessment were carried out at specific intervals throughout this study. The results showed that the mean arthritis and radiology scores for animal groups designated as CIA CurcuminC and CIA CurcuminT were significantly lower compared with the negative control (CIA OV) group respectively. The mean arthritis scores for CIA CurcuminC group is significantly lower compared with CIA CurcuminT group but there is no significant difference in the mean radiology scores between the CIA CurcuminC and CIA CurcuminT groups. In conclusion, the oral supplementation of curcumin at the dose of 110 mg/mL/kg/day has a potential to delay and improve joint abnormality and injury in Sprague-Dawley rats with CIA 18. Turmeric (*Curcuma longa* L., Zingiberaceae) rhizomes contain two classes of secondary metabolites, curcuminoids and the less well-studied essential oils. Having previously identified potent anti-arthritic effects of the curcuminoids in turmeric extracts in an
animal model of rheumatoid arthritis (RA), studies were undertaken to determine whether the
turmeric essential oils (TEO) were also joint protective using the same experimental model.
Crude or refined TEO extracts dramatically inhibited joint swelling (90-100% inhibition) in
female rats with streptococcal cell wall (SCW)-induced arthritis when extracts were administered
via intraperitoneal injection to maximize uniform delivery. However, this anti-arthritic effect was
accompanied by significant morbidity and mortality. Oral administration of a 20-fold higher dose
TEO was non-toxic, but only mildly joint-protective (20% inhibition). These results do not
support the isolated use of TEO for arthritis treatment, but, instead, identify potential safety
concerns in vertebrates exposed to TEO 32.

Cinnamomum zeylanicum L.
The efficacy of the polyphenol fraction from Cinnamomum zeylanicum bark (CPP) in animal
models of inflammation and rheumatoid arthritis was evaluated. Dose-response studies of CPP
(50, 100, and 200 mg/kg) used in a separate set of in vivo experiments were conducted in acute
carrageenan-induced rat paw edema), subacute (cotton pellet-induced granuloma), and sub-
chronic (AIA, adjuvant-induced established polyarthritis) models of inflammation in rats and the
acetic acid-induced writhing model of pain in mice. Effects of CPP on cytokine (IL-2, IL-4, and
IFNγ) release from Concanavalin (ConA)-stimulated lymphocytes were also evaluated in vitro.
CPP showed a strong and dose-dependent reduction in paw volume, weight loss reversal effects
against carrageenan-induced paw edema, and cotton pellet-induced granuloma models in rats.
CPP (200 mg/kg p.o. for 10 days) showed a significant reduction in elevated serum TNF-α
concentration without causing gastric ulcerogenicity in the AIA model in rats. CPP also
demonstrated mild analgesic effects during acute treatment as evidenced by the reduction in the
writhing and paw withdrawal threshold of the inflamed rat paw during the acetic acid-induced
writhing model and Randall–Selitto test. CPP was found to inhibit cytokine (IL-2, IL-4, and
IFNγ) release from ConA-stimulated lymphocytes in vitro. In conclusion, CPP demonstrated
prominent action in. 33

Type-A procyanidine polyphenols (TAPP) extracted from Cinnamon
(Cinnamomum zeylanicum) bark evaluated in animal models of inflammation and rheumatoid
arthritis in rats. Carrageenan-induced rat paw edema (CPE) and adjuvant induced established
arthritis (AIA), in rats were used as the experimental models for inflammation and arthritis
respectively. Analgesic activity was evaluated in Randall–Selitto assay in AIA rats. TAPP
showed significant anti-inflammatory effect at dose of 4, 8 and 25 mg/kg, p.o. but not at 2
mg/kg, p.o. dose in CPE model. The dose of 8 mg/kg, p.o. was selected for the evaluation of
anti-arthritic activity in AIA model. TAPP (8 mg/kg, p.o., daily from day-12 today-21) treatment
in established arthritic rats showed significant reversal of changes induced in AIA with respect to
body weight drop (cachexia), ankle diameter, arthritic score, serum C-reactive protein (CRP)
levels. Moreover, TAPP was found to be non-ulcerogenic as compared to AIA control rats.
However, TAPP did not show analgesic effect on AIA-induced pain as seen in Randall–Selitto
assay. In conclusion, TAPP showed disease-modifying potential in animal models of
inflammation and arthritis in rats 34.

CONCLUSION
The collection of plants in this review will be a remarkable tool for the researcher who involve in
research in this area. The persons, seeking a better treatment for rheumatoid arthritis will also
benefitted by this fruitful article.
REFERENCES


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