IN VITRO ANTI-ARTHRTIC ACTIVITY OF KASHAYA OF SIDA CORDIFOLIA LINN.

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ABSTRACT

Arthritis is a form of joint disorder that involves inflammation of one or more joints. It is very common condition especially in women and older people. Ayurveda has contributed a lot for the management of arthritic conditions. The plant Bala, identified as Sida cordifolia Linn, is a widely used drug in many of the Ayurvedic formulations especially in those for arthritic conditions. Kashaya (decoction) is one of the commonly prescribed preparations in Ayurveda. Present study was aimed to assess the anti-arthritic activity of Kashaya (decoction) of root of Sida cordifolia Linn. by inhibition of protein denaturation method and inhibition of proteinase enzyme activity. Kashaya of roots of Bala was prepared as per standard procedure and was used to induce protein denaturation in Bovine serum albumin and to inhibit the activity of proteinase enzyme, trypsin. The absorbance was read by spectrophotometer to evaluate the percentage of inhibition in both the procedures. Each experiment was done in triplicates. The results were compared with standard drug Diclofenac sodium. Sida cordifolia Linn. showed dose dependent inhibitory activity and highest activity was seen in 500µg/ml concentration in both the experiments. The result showed that root of Sida cordifolia Linn. is having anti-arthritic property. Further studies can be carried out with other formulations of Bala like Choorna (powder), Swarasa (juice) etc. to compare their anti-arthritic activity. The study supports the classical use of plant Bala in various formulations in the treatment of arthritic conditions.

KEYWORDS: Anti-arthritic activity, Sida cordifolia, Bala, Protein denaturation method, Proteinase enzyme activity.

INTRODUCTION

Arthritis affects about 15% of people in India. Arthritis is more common in women than men in all age groups. Common symptoms include swelling, pain, stiffness and decreased range of motion[1]. It may be caused by any infectious agent, immunological and genetic factors, association with primary diseases of cartilage or bone, joint or soft tissue disorders etc. Non-Steroidal Anti-Inflammatory drugs are the contemporary medical treatment advised. Ayurveda offers effective treatment for arthritic conditions. Bala, identified as Sida cordifolia Linn. is widely used in many Ayurvedic formulations like Balapunarnavadi kashayam, Balasahacharadi kashayam, Bala tailam, Ksheerabala tailam etc, which are indicated for conditions similar to arthritis. Anti-arthritic activity of various extracts of Sida cordifolia Linn. have already been proven in-vitro methods[2]. Analgesic, anti-inflammatory and hypoglycaemic activities of aerial and root extracts of Sida cordifolia Linn. have also been studied and proven in-vivo[3]. Antioxidant potential of ethanol extracts of leaf, stem, root and whole plant of Sida cordifolia Linn. has also been proved in-vivo[4]. An Ayurvedic formulation, Balapunarnavadi choornam, containing Bala as an ingredient was also evaluated and proved to have anti-arthritic activity in-vitro[5]. In Ayurveda many medicines are prescribed as Kashaya (decoction) where the complete plant part is made use in the preparation of Kashaya. The present study was done to evaluate the anti-arthritic activity of Kashaya of root of Sida cordifolia Linn.

MATERIALS AND METHODS

Plant Material

The fresh roots of Sida cordifolia Linn. were collected from their natural habitat at Thiruvananthapuram during their flowering season. Roots were washed well and shade dried. Dried roots were crushed into coarse powder to prepare Kashaya.

Preparation of Kashaya[6]

48gm of coarsely powdered drug was taken, washed well and boiled in 8 times of water (384ml). It was reduced to 1/4th part (96ml). It was filtered through a cotton cloth and the filtrate was collected as...
Kashaya. This freshly prepared Kashaya was used for evaluating the anti-arthritic activity.

**Evaluation of anti-arthritic activity**

Anti-arthritic activity was evaluated through Inhibition of protein denaturation method and Inhibition of proteinase enzyme activity. Diclofenac sodium was the standard drug used. Each experiment was done in triplicates and the average percentage of inhibition was calculated from the three results.

**Inhibition of Protein Denaturation Method**

Protein Denaturation Method was carried out as per standard procedure using Bovine serum albumin.

- **Test solution (0.5ml):** 0.05ml of decoction of root of Bala (*Sida cordifolia* Linn.) and 0.45ml of bovine serum albumin
- **Test control solution (0.5ml):** 0.45ml of bovine serum albumin and 0.05ml of distilled water
- **Product control solution (0.5ml):** 0.45ml of distilled water and 0.05ml of decoction of root of Bala (*Sida cordifolia* Linn.)
- **Standard solution (0.5ml):** 0.45ml of bovine serum albumin and 0.05ml of Diclofenac Sodium

All the sample solutions were incubated at 37°C for 20 minutes. Temperature was increased to 57°C for 3 minutes. It was then allowed to cool for some time and 2.5ml of phosphate buffer was added to all the above solutions. The absorbance of resulting solution was measured at 416nm using UV visible spectrophotometer. The percentage of inhibition by the root decoction of *Sida cordifolia* Linn. was calculated using the following formula;

\[
\text{Percentage of Inhibition} = 100 - \left( \frac{\text{Absorbance of test solution} - \text{optical density of product control}}{\text{Absorbance of test Control}} \right) \times 100
\]

**RESULTS**

The anti-arthritic activity of Kashaya of root of *Sida cordifolia* Linn. was evaluated by analyzing inhibition of bovine serum albumin denaturation and inhibition of trypsin enzyme activity. The results are summarized in Table 1 and Table 2.

### Table 1: In Vitro Anti-Arthritic Activity of Kashaya of Sida Cordifolia Linn. By Inhibition of Protein Denaturation Method

<table>
<thead>
<tr>
<th>Concentrations (µg/mL)</th>
<th>Percentage of Inhibition</th>
<th>Average Percentage of Inhibition</th>
<th>Percentage of Inhibition of Diclofenac Sodium (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Triplicate I</td>
<td>Triplicate II</td>
<td>Triplicate III</td>
</tr>
<tr>
<td>62.5</td>
<td>6.59</td>
<td>13.41</td>
<td>3.18</td>
</tr>
<tr>
<td>125</td>
<td>29.77</td>
<td>27.50</td>
<td>31.14</td>
</tr>
<tr>
<td>250</td>
<td>42.27</td>
<td>39.77</td>
<td>38.41</td>
</tr>
<tr>
<td>500</td>
<td>64.77</td>
<td>57.27</td>
<td>64.32</td>
</tr>
</tbody>
</table>
Table 2: In vitro Anti-Arthritic Activity of Kashaya of *Sida Cordifolia* Linn. by Inhibition of Proteinase Enzyme Activity

<table>
<thead>
<tr>
<th>Concentrations (µg/mL)</th>
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<th>Average Percentage of inhibition</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Triplicate I</td>
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<td>Triplicate III</td>
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<tr>
<td>62.5</td>
<td>7.26</td>
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<td>125</td>
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</tr>
<tr>
<td>500</td>
<td>68.55</td>
<td>80.65</td>
<td>64.78</td>
</tr>
</tbody>
</table>

Fig. 1: *Sida cordifolia* Linn.  
Fig. 2: Root of *Sida cordifolia* Linn.  
Fig. 3: Kashaya of root of *Sida cordifolia* Linn.  
Fig. 4: Solutions prepared for Inhibition of Protein Denaturation Method
Fig. 5: Solutions prepared for Inhibition of Proteinase Enzyme Activity

Fig. 6: Anti-arthritic activity of root of *Sida cordifolia* Linn. compared to Diclofenac sodium by Inhibition of Protein Denaturation Method

Fig. 7: Anti-arthritic activity of root of *Sida cordifolia* Linn. compared to Diclofenac sodium by Inhibition of Proteinase Enzyme Activity
DISCUSSION

The results show that *Sida cordifolia* Linn. root *Kashaya* has dose dependent anti-arthritic activity. In both the experiments, as the concentration was increased from 62.5µg/ml to 500µg/ml, the ability of the drug to inhibit the denaturation of protein and proteinase enzyme activity increased respectively. Maximum activity was shown in 500µg/ml. Literature shows that denaturation of proteins is associated with the pathology of arthritis\(^6\). The antigenic property acquired by some cells due to protein denaturation may initiate immune response in the body and result in biochemical changes in connective tissue. This may ultimately end up in rheumatoid arthritis. The study shows that the *Kashaya of Sida cordifolia* root has the ability to inhibit denaturation of protein and also to inhibit the activity of proteinase enzyme.

CONCLUSION

The evaluation of anti-arthritic activity through Inhibition of Protein denaturation method and Inhibition of proteinase enzyme activity proved that the *Kashaya of Sida cordifolia* root has the ability to resist arthritis. Though various extracts of *Sida cordifolia* Linn. have showed anti-arthritic activity, the study assured the efficacy of *Kashaya* formulation of the drug, justifying its use in various Ayurvedic formulations. The study also supports the use of *Sida cordifolia* Linn. as *Bala* in Ayurvedic medicines for treating arthritic conditions. Further studies can be carried out with other varieties of *Bala* mentioned in Ayurvedic classical text books and also with various Ayurvedic formulations containing *Bala*, for their anti-arthritic activity.

REFERENCES


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