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Anti-arthritic activity of *B. serrata* Freund's adjuvant induced arthritis in rats

Ziyyaurrahman AR*, Jasiya Devale, Kiran S Bhise

MCE Society's Allana College of Pharmacy, Azam Campus, Camp, Pune, India.

ORIGINAL RESEARCH ARTICLE	ABSTRACT
<p>ARTICLE INFORMATION</p> <hr/> <p><i>Article history</i> Received: 3 April 2015 Revised: 12 April 2015 Accepted: 20 April 2015 Early view: 23 April 2015</p> <hr/> <p>*Author for correspondence E-mail: rahman92@rediffmail.com</p> <hr/>  <p>Q R C o d e</p>	<p>Background: In the present study, methanolic extract of <i>Boswellia serrata</i> was assessed for anti-arthritic action using Freund's complete adjuvant (FCA) induced arthritis in rats.</p> <p>Material and methods: <i>B.serrata</i> (100mg/kg and 200 mg/kg p.o) was evaluated for anti-arthritic activity using Freund's complete adjuvant (FCA) induced arthritis in rats. <i>B.serrata</i> extracts at dose of 100mg/kg and 200 mg/kg p.o. was administered for 21 days after the injection of FCA in rats. The parameters like alkaline phosphatase, acid phosphatase, erythrocyte sedimentation rate and total WBC count was observed which the major markers of arthritis.</p> <p>Results: Significant inhibition ($P < 0.01$) of paw edema volume was observed from day 5th to 21st in the groups treated with <i>B. serrata</i>. Significant increase in all the markers was found in the rats treated by FCA. At dose of 100mg/kg and 200 mg/kg <i>B. serrata</i> display noticeable decrease in all markers. A better activity of <i>Boswellia serrata</i> was found at 200 mg/kg dose against FCA induced arthritis in rats.</p> <p>Conclusion: Present study indicates that <i>Boswellia serrata</i> has significant anti-arthritic activity against FCA induced arthritis in rats.</p> <p>Keywords: <i>Boswellia serrata</i>, Freund's complete adjuvant (FCA), prednisolone.</p> <p>Biomedjournal © Copyright 2013, All rights reserved. Biomedjournal Privacy Policy.</p>

INTRODUCTION

Arthritis is a chronic, progressive, systemic inflammatory autoimmune disorder affecting the synovial joints and typically producing symmetrical arthritis that leads to joint destruction, which is accountable for the defect and impairment. The significant morbidity and mortality has a substantial impact (Buch and Emery 2002). Prevalence of arthritis in Indian subcontinent is 1.5-2%. The epidemiological proportion of arthritis in female and male is 3:1 and the prevalence is 1%. FCA encouraged arthritis in rats is a chronic inflammatory disease characterized by infiltration of synovial membrane in association with destruction of joints resembles RA in humans (Katz and Piliero, 1969).

B. serrata possess antioxidant, anti-inflammatory, anticancer and anti-allergic potential (Akaishi et al., 2008; Ke et al., 2008; Sriram and Subramanian, 2010). It not only prevents effectively lysosomal enzyme secretion but also release of arachidonic acid in neutrophils of rats (Tordera et al., 1994). More, *B. serrata* tops mammalian 5-

lipoxygenase and cyclooxygenase enzymes (Laughton et al., 1991).

B. serrata contains boswellic acids which play as a vital role for treatment of various anti-inflammatory disorders. *Boswellia* extract is thought as an alternate to NSAID due to fewer side effects.

The present study has been carried out to evaluate the antiarthritic activity of methanolic extract of *B. Serrata* on the Freund's adjuvant induced arthritis in rats.

MATERIALS AND METHODS

Animals

Male albino rats of Wistar strain weighing 160-180 g were purchased from National Institute of Biosciences, Pune and kept in quarantine for one week in housed at the institute animal house in groups of six animals per cage at standard laboratory conditions at a temperature of $24^{\circ}\text{C} \pm 1^{\circ}\text{C}$, humidity of 45-55% and 12:12 hours dark and light cycle. The experiments were performed between 10:00 a.m. to 5:00 p.m. Animals had access to food and water *ad libitum*. Experimental protocols were approved

by the Institutional Animal Ethics Committee. Animals were kept in testing laboratory 1 hr before the experimentation for adaptation purpose. The investigation was done in noise free space.

Acute oral toxicity study

Acute toxicity test were performed on rat of either sex weighing 160-180 g body weight as per the OECD guidelines 423. Changes in behavioral, toxicity and motility of animals were observed for 48 hrs. Extract has exhibited no mortality in animals up to 3000 mg/kg dose. Therefore 100 mg/kg and 200 mg/kg dose were selected as the therapeutic dose.

Complete Freund's adjuvant induced arthritis

Arthritis was induced by a single intra-dermal dose (0.1 ml) of Freund's Complete adjuvant (FCA) comprising 1.0 mg dry heat-killed *Mycobacterium tuberculosis* per milliliter sterile paraffin oil into a foot pad of the left hind paw of rats. A glass syringe (1 ml) with the locking hubs and a 26G needle was used for injection. Animals were anesthetized with ether inhalation prior to and during adjuvant injection. The swelling of paws of animals were examined from time to time (up to 21 days) in each paw from the ankle using Digital Plethysmometer (Winter CA et al., 1962).

Experimental set up

Animals were divided in five groups as follows:

Group I: Control group.

Group II: FCA induced arthritic group.

Group III: FCA with prednisolone (10 mg/kg).

Group IV: FCA with extract of *B. serrata* (100 mg/kg).

Group V: FCA with extract of *B. serrata* (200 mg/kg).

Statistical analysis

Data were expressed as mean \pm standard error mean (S.E.M.). Data was analyzed by one way analysis of variance (ANOVA) followed by Dunnett's. $P < 0.05$ and 0.01 were considered to indicate statistical significance.

RESULTS

Paw volume

Fig.1 shows change in paw volume measurement after the administration of prednisolone 10 mg/kg and *B. serrata* 100 and 200 mg/kg. Whereas for more than 20 days gradually the adjuvant injected paw turns out to be swollen. The alteration in paw volume might be separated in two stages. In first stage, edema rate of the injected foot pad increase and reached a peak during first 5-10 days. Thereafter, swelling gradually decreased until 15th day when the paw began to swell again and peaked in the 3rd week (second stage). After the adjuvant injection, Prednisolone and *B. serrata* shown significantly ($P < 0.01$) suppress the secondary increase in swelling of injected foot in all groups as compare to arthritic control (Group II). The Group V (*B. serrata* 200 mg/kg) produced a better suppression of paw volume as compared to 100 mg/kg (Fig.1).

Bio-marker estimation

A marked increase in the activity of biological marker enzymes ALP and ACP were observed in the serum of arthritis rats (Group II). Rats treated with prednisolone (10 mg/kg) and *B. serrata* (100 and 200 mg/kg) displayed a significant ($P < 0.01$) reduction in membrane marker enzyme activity (Figure 2).

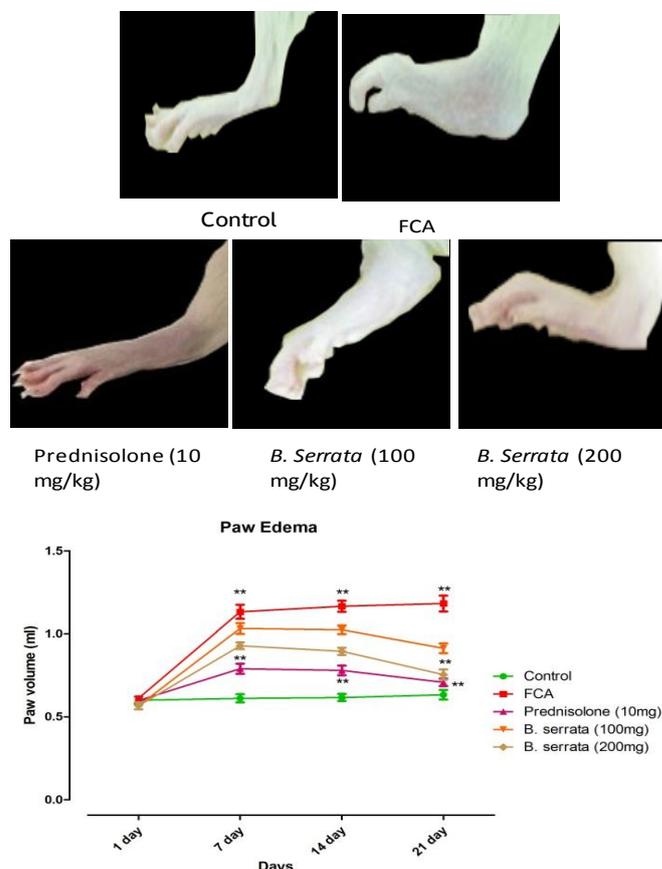


Figure 1. Change in paw edema in control and experimental rat.

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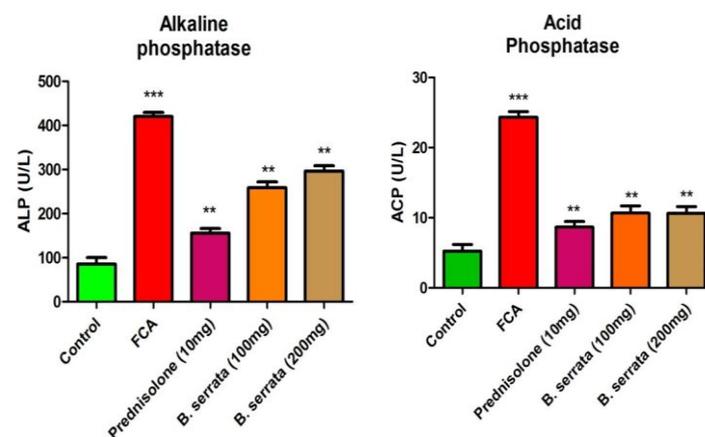


Figure 2. Effect of *B. serrata* in membrane marker enzymes of control and treated rats.

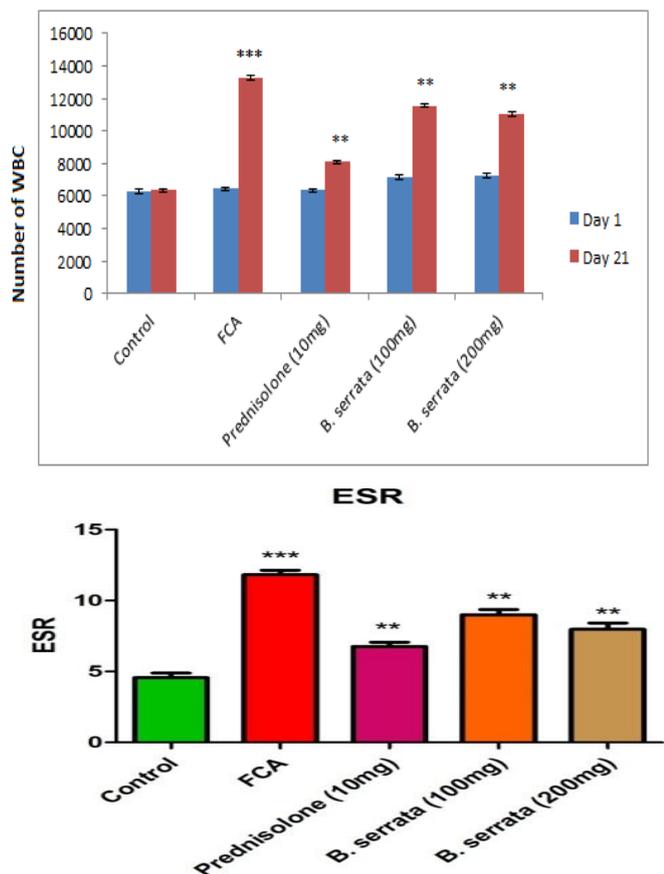


Figure 3. WBC count and erythrocyte sedimentation rate of control and treated rats.

DISCUSSION

Adjuvant induced arthritis inhibition in rats is one of the most suitable test procedures to screen anti-arthritic agents since it closely resembles human arthritis reported by most of the investigators.

Reduction of paw swelling by *B. serrata* at dose of 100 and 200 mg/kg body weight treated rats from the second week onwards (Fig.1 and 2) might be owed to immunological defense and controlling migration of WBC (Olsen I et al., 1990).

In the present study, the activity of lysosomal enzymes in plasma was markedly increased in the adjuvant induced arthritic rats and significantly ($P < 0.01$) reduced after treatment with *B. serrata* at dose of 100 and 200 mg/kg body weight (Fig. 2). An essential mechanism of antiarthritic activity is the membrane stability modulating effect (Subrata et al., 1994).

It was found that the administration of *B. serrata* (100 and 200 mg/kg body weight) leads to inhibition of leukocyte migration which may have beneficial effect for joint preservation.

Erythrocyte sedimentation rate (ESR) in the FCA treated group several fold high compared to drug treated groups (Fig. 3).

CONCLUSION

Present study indicates that *Boswellia serrata* has significant anti-arthritic activity against FCA induced arthritis in rats.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST

None declared.

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