British Journal of Pharmaceutical Research
12(4): 1-5, 2016, Article no.BJPR.25727
ISSN: 2231-2919, NLM ID: 101631759

SCIENCEDOMAIN *international*
www.sciencedomain.org

Evaluation of the Anti-Inflammatory Activity of the Methanolic Extract of the Fruits of *Ficus palmata*

Subhash Chandra[1*] and Sarla Saklani[1]

[1]Department of Pharmaceutical Chemistry, H. N. B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, 246174, India.

Authors' contributions

This work was carried out in collaboration between both authors. Author SC designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SS managed the analyses of the study. Author SC managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJPR/2016/25727
Editor(s):
(1) Dongdong Wang, Department of Pharmacogonosy, West China College of Pharmacy, Sichuan University, China.
(2) Ke-He Ruan, Director of the Center for Experimental Therapeutics and Pharmacoinformatics (CETP)Professor of Medicinal Chemistry & Pharmacology, Department of Pharmacological and Pharmaceutical Sciences, University of Houston, USA.
Reviewers:
(1) A. Veerareddy, Suven Life Sciences Ltd., Hyderabad, India.
(2) Leonor Thomson, Universidad de la República, Uruguay.
(3) Nuhu Sambo, Bingham University, Nigeria.
(4) Ravendra Singh, Rutgers University, USA.
(5) Yonghua Wang, Northwest A&F University, Shaanxi, China.
Complete Peer review History: http://sciencedomain.org/review-history/15426

Original Research Article

Received 17th March 2016
Accepted 1st June 2016
Published 19th July 2016

ABSTRACT

Aim: This study was aimed to evaluate the possible *in vivo* anti-inflammatory activity of the methanolic extract of fruits of *Ficus palmata*.
Place and Duration of the Study: *In vivo* studies were carried out in the Animal House of the S.B.S Ballawala Dehradun, Uttarakhand, India, between December 2014 and March 2015).
Study Design: Three different doses of methanolic extract were tested in this study regarding their anti-inflammatory activity.
Methodology: *In vivo* studies of anti-inflammatory effects of feeding adult albino rats under investigation with three different doses (50, 100 and 150 mg/kg^{-1}) of methanolic extract were carried out after 24 hours of inducing inflammation by injecting investigated animals with carrageen.
Results: The results of anti inflammatory activity study showed that the fruit extracts at doses of 50, 100 and 150 mg/mL inhibited carrageenan induced paw edema in rats. The percent inhibition

**Corresponding author: E-mail: subhashkothiyal@gmail.com;*

of writhing response by the extract was 28.57, 56.08 and 58.73 respectively, after 4 h of Carrageenan induction.

Conclusion: In the present work a potent anti-inflammatory activity of methanolic extract of the fruits of *Ficus palmata* were demonstrated, validating the ethno pharmacological claims. These experimental findings would further establish the scientific basis of the traditional uses of the plant in the management of inflammatory conditions as well as control of pain.

Keywords: Ficus palmata; Bedu and anti-inflammatory activity.

1. INTRODUCTION

Herbal medicine has been widely practiced from ancient period to the present day with much more attention than allopathic drugs because of their minimum side effects and cost-effectiveness throughout the world [1]. Medicinal plants represent a rich source of potent and powerful drugs. The treatment of human and animal disease depends mainly on natural products derived from plants, animals, microorganisms and minerals.

The term inflammation has been derived from "inflammare" which meaning as burning. Inflammation is considered as a primary physiologic defense mechanism that helps the body to protect itself against infection, burn, toxic chemicals, allergens or other noxious stimuli, however uncontrolled and persistent inflammation may act as an etiologic factor for many chronic illnesses [2]. All types of human body injuries results in chemical changes in the injured area. Generally, the process of inflammation is associated with the activation of IL-1beta, IL-gamma and TNF-alpha, by activated cells which play major role in host defense mechanism. Steroidal and non steroidal anti-inflammatory drugs provide a rapid and effective but only temporary release and are inadequate for long term use [3-6].

Ficus palmata also known as Bedu belongs to the Moraceae family and the fruits are used as a dry vegetable. *F. palmata* has been used as squash, jam and jelly [7]. *F. palmata* fruits are used to treat different diseases i.e gastrointestinal disorders, hypoglycaemic, anti-tumour, anti-ulcer, anti-diabetic, lipid lowering and antifungal activities.

2. MATERIALS AND METHODS

2.1 Chemicals and Drugs

All the chemicals and reagents used were of analytical grade such as Indomethacin (Merck, Bangalore, India) and Carrageenan (Sigma Chemicals, St. Louis, MO, USA).

2.2 Plant Material

The materials included fresh and dry fruits of *Ficus palmata* collected from Chamoli, Uttarakhand district, during August-September 2014. These plants were authenticated by the Taxonomy Laboratory, Department of Botany, HNB Garhwal University, Srinagar. The voucher specimens GUH 2853 were deposited in the University herbarium for future records.

2.3 Preparation of Plant Extract

The fruits were first shade dried for a week. Then the crushed fruits were ground into coarse powder with the help of a mechanical grinder and soxhlet extracted with petroleum ether, chloroform, ethyl acetate, acetone, methanolic, ethanolic and water using the soxhlet apparatus [8]. Each extract was evaporated to dryness under reduce pressure using a rotary evaporator. The extracts thus obtained were stored in air tight container at 4℃ until further analysis.

2.4 Experimental Animals

The wistar rats (100-150 g) were obtained from the Animal House, National Centre of Fungal Taxonomy, New Delhi, India. They were housed at a temperature 24±1℃, 12 hour light/dark cycle 35-60% humidity, in polypropylene cages and fed a standard rodent diet with water ad *libitum.* The animals were deprived of food but not water 4 hours before the experiment. The experimental design was approved by the ethical committee for animal experimentation of faculty of Pharmaceutical Science (S.B.S Ballawala Dehradun Uttarakhand) bearing the number 273/PP/SCEA.

2.5 Acute Toxicity Study

To determine the minimum lethal dose, acute oral toxicity studies were performed as per

OECD guidelines [9]. Adult albino rats of either sex weighing 100-150 g were used. The animals were divided into five groups of six each. Group I was given 2 mL of 1% saline (10 ml/kg) and group II received 2 mL of 1% vanillin (10 ml/kg) both acted as control. The other three groups were administered of the methanolic extract with 2 mL of 1% vanillin (10 ml/kg) orally using intra Gastric Catheter. All the experimental rats were fasted overnight. They were observed continuously for any gross behavioural change and toxic manifestations like hyperactivity, grooming, convulsions, sedation, hypothermia and mortality during the first three hours. Thereafter the animals were continuously monitored at regular intervals for 7 days. No adverse effects or mortality were detected in this study.

3. METHODOLOGY

3.1 Carrageenan Induced Rat Paw Edema Assay

Acute anti-inflammatory activity studies were performed following the Carrageenan induced hind paw edema [10]. The rats were divided into five groups of six rats each. Group 1 acted as control and was given 1% saline, Group 2 received 100 mg/kg of the standard reference drug – Indomethacin, Group 3, 4 and 5 were administered 50, 100 and 150 mg/kg of the methanol extract with 2 ml of 1% vanillin, respectively. To induce paw edema 0.1 mL of 1% Carrageenan and distilled water was injected intradermally to the rats into the plantar surface of the right hind limb. The paw volumes were measured plethysmographically before (0 H) and following induction, at (1 H) intervals for (4 H). The paw volume in group II, III and IV were compared with that of the control. Percentage inhibition was calculated using the formula,

$$\% \text{ Inhibition} = (V_C - V_T/V_C) \times 100$$

Where, V_C= Paw volume in control group,
V_T= Paw volume in drug treated group.

3.2 Statistical Analysis

The data are expressed as the mean±SEM analyzed by one-way analysis of variance (ANOVA) and Tukey's t-test was used as the test of significance. P value<0.05 was considered as the minimum level of significance. All statistical tests were carried out using SPSS statistical software [11].

4. RESULTS AND DISCUSSION

In this study, we evaluated the anti-inflammatory activity of the methanolic extract of the fruits of *Ficus palmata* by carrageenan-induced paw edema model. The carrageenan-induced paw edema model is a suitable test for evaluating anti-inflammatory activity of a drug in the acute phase of inflammation. Edema induced by carrageenan is believed to be biphasic. The first phase (1 hour) involves the release of serotonin and histamine and the second phase (> 1 hour) is mediated by cyclooxygenase products. Continuity between the two phases is provided by kinin. The results of anti-inflammatory activity of the fruit extracts of *Ficus palmata* against carrageenan induced paw edema are shown in [Table 1]. Paw volume was significantly reduced (P<0.01) in all treated groups as compared to control group [Fig. 1]. Methanolic extract at dose 150mg/kg showed more significant inhibition of edema (0.312±0.03) than 100 mg/kg dose (0.332±0.02). However the anti inflammatory activity showed by two different doses of methanolic extract were found to be significant but less effective than reference standard compound i.e. Indomethacin (0.312±0.01).

When methanolic fruits extract of *Ficus palmata* at 100 mg/kg body weight per day was given orally as a suspension the paw volume was reduced by 56.08%, whereas in case of the same extract of *Ficus palmata* at 150 mg/kg body weight per day shows a 58.73% inhibition, which indicate that the effect of methanolic extract of *Ficus palmata* reflected in a dose-dependent

Table 1. *In vivo* anti-inflammatory effect of methanolic extract of *Ficus palmata* fruit on carrageenan induced paw edema in rats

Group	Dose mg/kg	Paw volume in ml ± SEM and percentage inhibition			
		+1 Hour	+2 Hour	+3 Hour	+4 Hour
I	Control	0.638±0.01	0.687±0.03	0.698±0.02	0.756±0.04
II	Indome-thacin	0.462±0.02	0.405±0.05	0.363±0.08	0.312±0.01
III	50	0.540±0.04	0.556±0.08	0.536±0.01	0.540±0. 05
IV	100	0.495±0.02	0.484±0.03	0.378±0.03	0.332±0.02
V	150	0.462±0.03	0.433±0.04	0.332±0.04	0.312±0.0 3

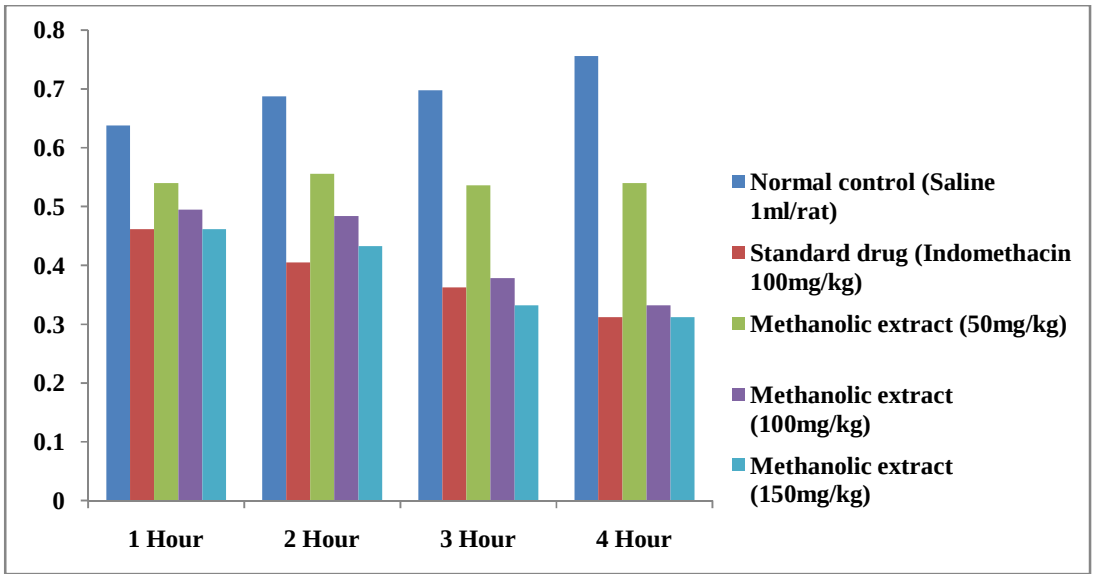

Fig. 1. Comparison of standard drug (Indomethacin) with different methanolic extract of *Ficus palmata* fruit on rats

manner [Fig. 1]. Hence, both doses of methanolic extract showed an inhibitory effect on carrageenan-induced paw edema thus exhibiting anti-inflammatory effect against acute inflammation.

5. CONCLUSION

It can be concluded that the methanolic extract of the fruits of *Ficus palmata* possess potent anti-inflammatory activity thus validating the ethno pharmacological claims. This knowledge could be tapped to formulate new agents to treat inflammatory and allergic ailments. The present study was attempted for the first time to investigate the anti-inflammatory activity of *F. palmata* to search for newer, safer and more potent anti-inflammatory agent and we herein delineate the results of our study.

CONSENT

It is not applicable.

ACKNOWLEDGEMENT

This work is financially supported by UCOST, Dehradun [UCS&T/R&D/CHEM-16/09/10/6539/1]. The authors would like to thanks Dr. Abhishek Mathur, Sr. Scientist B and Prof. Versha Parcha, SBS Ballawala, Dehradun, for animal's activity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ayanar M, Ignacimuthu S. Medicinal plants used by the tribals of Tirunelveli hills, Tamil Nadu to treat poisonous bites and skin diseases. I. J. Trad. Knowl. 2005;4(3):229-236.
2. Kumar V, Abbas AK. Fausto N (eds.) In: Robbins and cotran pathologic basis of disease. 2004;7th edition:47-86.
3. Gautam R, Jachak SM. Recent developments in anti-inflammatory natural products. Medicinal research reviews. 2009;29:767-820.
4. Cho, Shin, Noh, Cho, Hong, Park, Lee. Antiinflammatory effects of methanol extract of Patrinia scabiosaefolia in mice with ulcerative colitis. Journal of Ethnopharmacology. 2001;136:428-435.
5. Jani N, Regueiro MD. Medical therapy for ulcerative colitis gastroenterol. Clinical N. Am. 2002;31:147-166.
6. Lakatos PL, Lakatos L. Ulcerative proctilis: A review of pharmacotherapy and management, expert. Opin. Pharmacother. 2008;9:741-749.
7. Saklani S, Chandra S. *In vitro* antimicrobial activity, nutritional profile and

phytochemical screening of wild edible fruit of Garhwal Himalaya (*Ficus auriculata*). International Journal of PR. Research. 2012;12(2):61-64.

8. Lin J, Opak War, Geheeb-Keller M. Preliminary screening of some traditional zulu medicinal plants for anti- inflammatory and antimicrobial activities. Journal of Ethnopharmacology. 1999;68;267–274.
9. OECD guidelines for testing of chemicals [Internet]. France. Organization for Economic Cooperation and Development (OECD). July 11. Section 4, Health effects: Test No. 425: Acute oral toxicity: Up-and-Down Procedure. 2006;1–27. Available:http://www.oecdbookshop.org/oecd/index.Adopted 2008
10. Winter CA, Risley EA, Nuss GW. Carrageenan induced edema in hind paw of the rat and an assay for anti-inflammatory drugs. Proceeding of the Society of Experimental Biology and Medicine. 1962;111:544-547.
11. Snecdecor GW, Cochran WG. Statistical mehods. Lowa State University Press. Lowa, USA. 1980;75.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/15426