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ANTI-INFLAMMATORY ACTIVITY OF THE CHLOROFORM EXTRACT OF THE ROOT BARK OF FICUS EXASPERATA ON CARRAGEENAN-INDUCED RAT PAW OEDEMA

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ABSTRACT

The results showed that the anti-inflammatory activity of the chloroform extract at 375 mg was better than that of the standard, diclofenac at the 1st and 3rd hr after the administration of carrageenan and compared favourably with diclofenac at the 4th hour. Thus the present study has shown that the chloroform extract of the root bark of Ficus exasperata possesses significant anti-oedematogenic effect on foot pad oedema induced by carrageenan and therefore justifies its use in the treatment of pain and inflammatory conditions in folklore medicine.

KEYWORDS: Inflammation, Ficus exasperata, Oedema, Chloroform, Diclofenac, Carrageenan.

INTRODUCTION

Inflammation is the body's response to disturbed homeostasis caused by infection, injury or trauma resulting in systemic and local effects. An inflammatory reaction serves to establish a physical barrier against the spread of infection and to promote healing of any damaged tissue.[1] In the absence of inflammation, wounds and infections would never heal and progressive destruction of the tissue would compromise the survival of the organism. However, inflammation which runs unchecked can also lead to a host of diseases, such as hay fever, atherosclerosis, and rheumatoid arthritis. An inflammatory reaction may be triggered by infection (invasion and multiplication within tissues by various bacteria, fungi, viruses and protozoa, which in many instances, cause damage by release of toxins that directly destroy host cells), trauma, thermal injury, chemical injury, and immunologically mediated injury. It is characterized by excessive heat, swelling, pain, and redness. It is a common factor in arthritic diseases or osteoarthritis.

The rapid response to an injurious agent that serves to deliver mediators of host defence leukocytes and plasma proteins to the site of injury is known as acute inflammation. It has three major components: vasodilation, vascular leakage, oedema and leukocyte emigration (mostly polymorphonuclear cells). When a host encounters an injurious agent, such as an infectious microbe or dead cells, phagocytes that reside in all tissues try to get rid of these agents. At the same time, phagocytes and other host cells react to the presence of the foreign or abnormal substance by liberating cytokines, lipid messengers, and the various other mediators of inflammation. Some of these mediators act on endothelial cells in the vicinity and promote the efflux of plasma and the recruitment of circulating leukocytes to the site where the offending agent is located. The recruited leukocytes are activated by the injurious agent and by locally produced mediators, and the activated leukocytes try to remove the offending agent by phagocytosis. As the injurious agent is eliminated and anti-inflammatory mechanisms become active, the process subsides and the host returns to a normal state of health. If the injurious agent cannot be quickly eliminated, the result may be chronic inflammation. Chronic inflammation is a pathological condition characterised by recurrent active inflammation, tissue destruction, and attempts at repair. It is not characterised by the classic signs of acute inflammation listed above.[2]

The genus Ficus consist of woody trees, shrubs, vines, epiphytes, and hemiepiphytes.[3] They are collectively known as fig trees or figs. They are native throughout the tropics with few species extending into the semi-warm temperate zones.

The use of medicinal plants to improve health is as old as humanity. Among these plants, none may be older than the fig.[4] A number of Ficus species are used for medicinal purposes in Ayurvedic and Traditional Chinese Medicine especially amongst people where

these species grow. These uses, however, originated and are most widely found in the Middle East. In Iran, a decoction of the fruits of Ficus carica is taken orally for bronchitis, cystitis and nephritis.[5] Pharyngitis and stomatitis are treated with an oral decoction of the dried shoots.[6] In West Africa and Papua New Guinea, the dried leaf buds of F. septica are taken orally for headache and gastroenteritis.

A number of Ficus species have shown diverse biological and pharmacological activities. They have been investigated as potential repository of natural products for the treatment of various diseases including tumors, inflammatory diseases, wound healing and as antioxidants.

MATERIALS AND METHOD

Collection of Plant Materials

The roots of Ficus exasperata were collected in a plantation in Ondo, Ondo State, Nigeria. The samples were identified at the Department of Crop, Soil and Pest Management, Federal University of Technology, Akure, Nigeria, where a voucher specimen has been deposited in the herbarium.

Extraction

500 g of the root bark of F. exaspetrata was pulverized and soaked separately with chloroform at room temperature (25-30°C). After 72 h, the extract was filtered and later dissolved in Tween 80 followed by normal saline to get the required concentrations of 250 and 375 mg/Kg body weight and were used for screening anti-inflammatory activity.

$$\% \text{ Yield} = \frac{\text{Weight of the extract}}{\text{Weight of crude}} \times 100$$

Animals

Wistar rats were obtained from a farm in Ibadan and were housed in polythene cages at a population density of 5 rats per cage. Food (Chick Mash) and water were available ad libitum through 1-qt gravity-fed feeders and waterers. The room temperature was maintained at 29 °C, and overhead incandescent illumination was maintained on 12-hour light-dark cycle. Daily maintenance was conducted during the first quarter of the light cycle. Rats were allowed to acclimatized for 7 days before the start of the experiment. Group sample size of 5 was used throughout the study.

Carrageenan-induced Paw Oedema in rats.

The anti-inflammatory activity of the extracts was done by carrageenan- induced rat paw oedema model[7], with some modifications by Woode et al.[8], Wistar rats of either sex weighing 150 – 200 g were divided into 4 groups (N=5). Group-I received normal saline (control), Group- II, and III received chloroform extract (250, 375 mg/kg b.wt) respectively. Group-IV received Diclofenac (reference standard 10mg/kg b.wt). Animals were treated with drugs by oral route and subsequently 1 h after treatment; 0.1 ml of 1 % carrageenan in 0.9% normal saline was injected into the left hind paw of each rat to induce oedema. The effect produced by the different test agents was determined by measuring the linear paw circumference before (at 0 h) and at 1, 2, 3 and 4hr after carrageenan injection. Also, the percentage inhibition in each group at 3 h and 4 h for the extracts, carrageenan injection was determined and the results compared with the reference standard.

RESULTS AND DISCUSSION

Extraction and Acute Toxicity

The yield of the CLO extract was 0.5% W/W dry matter and the acute toxicity test of the extracts produced no death or signs of toxicity after 48 h.

Effects of CLO extract on Carrageenan-induced Paw Oedema in Rats

The present study was aimed at investigating the root bark extract of F. exasperata for anti-inflammatory activity, using carrageen-induced foot oedema model in rats. Carrageenan-induced oedema is a multi-mediated phenomenon that releases various inflammatory mediators. It is biphasic; the first phase (1hour) involves the release of serotonin and histamine whilst the second phase (over 1 hour) is mediated by prostaglandins.[9;10] The extracts inhibited the increase in foot volume significantly ($P<0.001$) from the second hour and thus, presumably, inhibited the synthesis and release of prostaglandins as well as kinins responsible for the inflammation.[9]

While there was a decrease in paw circumference with time, in the control group, there was no noticeable change in paw oedema from 1-4 hr after the injection of carrageenan. (Fig.1).

The results showed that the anti-inflammatory activity of the chloroform extract at 375 mg was better than that of the standard, diclofenac at the 1st and 3rd hr after the administration of carrageenan and compared favourably with diclofenac at the 4th hour. Conversely, at 250 mg the extract is pro-inflammatory rather than anti-inflammatory (Fig. 2). This implies that it is not safe at low doses. This strongly agrees with the work of Famobuwa et al.[11]

Thus the present study has shown that the root bark extract of Ficus exasperata possesses significant anti-oedematogenic effect on foot pad oedema induced by carrageenan and therefore justifies its use in the treatment of pain and inflammatory conditions in folklore medicine.

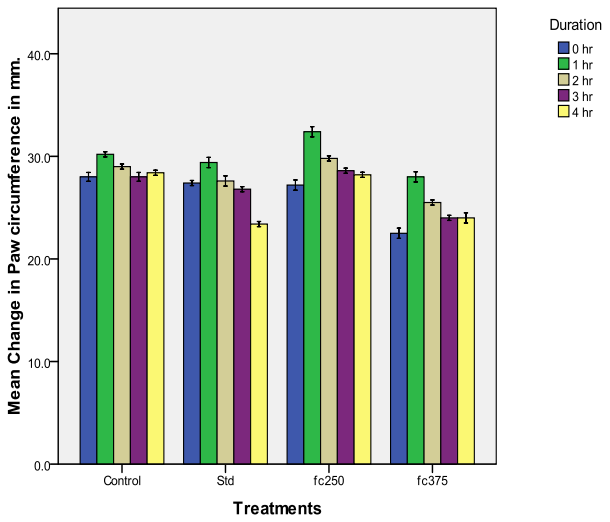

Figure 1: Mean Change in Paw circumference in mm.
Std = Diclofenac; **fc250** = 250 mg/Kg of the extract; **fc375** = 375 mg/Kg of the extract**.**

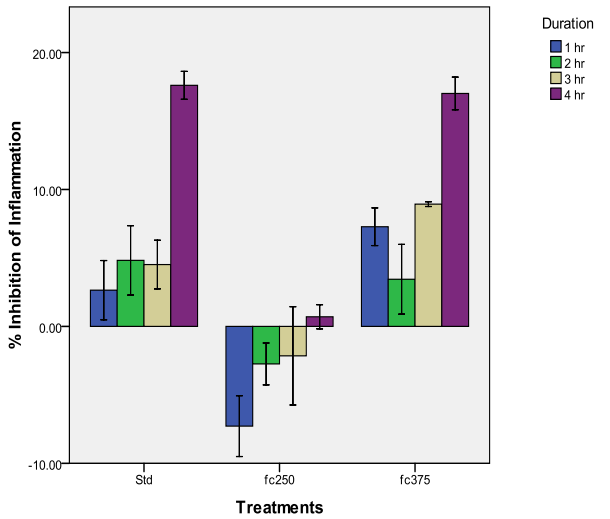

Figure 2: % Inhibition of Inflammation.
Std = Diclofenac; **fc250** = 250 mg/Kg of the extract; **fc375** = 375 mg/Kg of the extract**.**

CONCLUSION

This work has demonstrated that the chloroform extract of the root bark of F. exasperata exhibits appreciable anti-inflammatory activity at high dose of 375 mg/Kg and compared favourably with diclofenac at the 4th hour after the administration of carrageenan.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The authors declare that this work was not against public interest. Animal experiments were conducted in accordance with NIH guidelines for care and use of Laboratory animals (Pub. No. 85–23, Revised 1985).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Hansson, G. K. Inflammation, atherosclerosis, and coronary artery disease. New England Journal of Medicine, 2005; 1685-1695.
2. Cotran RS, Kumar V, Robbins SL. Pathologic basis of disease. W.B. Sanders Company, Philadephia, 1994; 51-92.
3. Sirisha, N., Sreenivasulu, M., Sangeeta, K. and Chetty, C. M. Antioxidant Properties of Ficus Species: A Review, International Journal of Pharm Tech Research, 2010; 2(4): 2174-2182.
4. Lansky, E. P., Paavilainen, H. M., Pawlus, A. D. and Newman, R. A. Ficus spp.(fig):Ethnobotany and potential as anticancer and anti-inflammatory agents Journal of Ethnopharmacology, 2008; 119: 195-213.
5. Zagari, A. Medicinal Plants. Tehran University Publications, Tehran, Iran, 1992: 5(4): 969–973.
6. Darias, V., Bravo, L., Barquin, E., Herrera, D. M. and Fraile, C. Contribution to the ethnopharmacological study of the Canary Islands. Journal of Ethnopharmacology, 1986; 15: 169–193.
7. Roach, J. T. and Sufka, K .J. Characterization of the chick carrageenan response. Brain Research, 2003, 994: 216-225.
8. Woode, E., Poku, R. A., Ainooson, G. K., Boakye-Gyasi, E., Abotsi, W. K. M., Mensah, T. L. and Amoh-Barimah, A. K. An evaluation of the antiinflammatory, antipyretic and antinociceptive effects of Ficus exasperata (Vahl) leaf extract. Journal of Pharmacology and Toxicology, 2009; 4(4): 135-151.
9. Asongalem, E. A., Martins, F. R. and Matheus, M. E. Investigation of anti-inflammatory, lack of central analgesia and antipyretic properties of Acanthus montanus (Ness) T. Anderson. Journal of Ethnopharmacology, 2005; 95: 63-68.
10. Perianayagem, J. B., Sharma, S. K., Pellai, K. K. Anti-inflammatory activity of Trichoderma indicum root extract in experimental animals. Journal of Ethnopharmacology, 2006; 104: 410-414.
11. Famobuwa, O. E., Osho, I. B, Akinlami O. O and Agbowuro A. A. Anti-inflammatory Activities of the Chloroform Extract of the Fruit of Tetracarpidium conophorum (Mull. Arg.) (Nigerian Walnuts). Journal of Advances in Medical and Pharmaceutical Sciences, 2016; 6(1): 1-7.