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ANTI-INFLAMMATORY POTENTIAL OF THE AQUEOUS ROOT EXTRACT OF ARISTOLOCHIA RINGENS (VAHL)

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ABSTRACT

This study was carried out to investigate the anti-inflammatory potential of the aqueous root extract of *Aristolochia ringens* (AR) (10-100 mg/kg p.o). Aqueous root extract of *Aristolochia ringens* was evaluated for anti-inflammatory potential using standard Carrageenan-induced rat paw oedema model. The activities of the extract at varying doses were compared to indomethacin a standard anti-inflammatory drug. In all the experiment, AR (10-100 mg/kg) significantly (P= 0.05) reduced increase in rat paw size with a peak effect of 57.10% observed by the sixth hour at 25 mg/kg. This is comparable to the 57.90% reduction by indomethacin (10 mg/kg) at the fourth hour, by which time AR (50 mg/kg) produced a comparable 52.60%. This results show that the aqueous of *Arisolochia rigens* possesses anti-inflammatory potential. It is therefore advisable that the use of this extract in herbal medicine should be encouraged.

KEYWORDS: *Aristolochia ringens*, anti-inflammatory activity, carrageenan, herbal medicine.

INTRODUCTION

Inflammation is a protective defense mechanism of the body to disturbed homeostasis due to conditions such as infection and injury that result in systemic and local effects, signs of which may include pain, redness, swelling, heat and loss of function in the affected region.[1] The inflammatory process is usually necessary for the removal of noxious stimuli and healing of wounds that may arise in the process, if uncontrolled, however, it may lead to the development of diseases.[2] The combination of the complex mechanisms and mediators involved can induce and worsen inflammatory disorders such as rheumatoid arthritis and arteriosclerosis.[3] Hence the need for anti-inflammatory drugs. The most commonly used drug for management of inflammatory conditions are non-steroidal anti-inflammatory drugs (NSAIDs)[4], which have several adverse effects especially gastric irritation leading to formation of gastric ulcer.[5] Thus, there is a need to search for new anti-inflammatory agents with little or no side effect. Natural products of plant, animal or microorganism origin have been good sources of new bioactive compounds.[5] *Aristolochia ringens* (Vahl.) Aristolochiaceae is a bushy climber native to tropical America and introduced to most West African countries such as Sierra Leone and Nigeria, where it is used in traditional medicine for the management of rheumatoid arthritis, diarrhoea, snake bites and asthma.[6] Its anti-diarrhoeal activity has been demonstrated in our laboratory.[7] A. ringens root extract is very commonly used medicinally in Nigeria though in small doses and for short periods. The oral acute toxicity of its aqueous extract has shown that it is relatively safe on acute oral exposure as it did not produce any mortality or visible morbidity in the mice treated with up to 10,000 mg/kg according to Adeyemi et al.[7], who also reported that the extract contains phyto-actives such as alkaloids, tannins, oils, saponin and reducing sugars, some of which have been reported to possess anti-inflammatory activities.[8] Therefore, the present study was conducted to investigate the anti-inflammatory potential of the aqueous root extract of *Aristolochia ringens*.

MATERIAL AND METHOD

Experimental Plants: The roots of *Aristolochia ringens* root were purchased from the market, in Ondo southwest, Nigeria. Authentication of the plant was done in the department of Biological Science of the Institute.

Preparation of Aqueous Extract: The identified plants materials were air dried for four weeks and pulverized into fine powder using clean and sterile Mortar and Blender. The powdered samples were sieved and quartered to obtain a representative of 1000g used for this study.

Hundred grammes of the air dried powdered root was soaked in 1 liter of distilled water and placed in a refrigerator at 4^{o}C for 5 days. The liquid was decanted into a beaker of known weight and oven dried at 40^{o}C. Required concentrations were made from the extract for

anti-inflammatory activity screening. The percentage yield of the extract was 4.18%.

Test Animals: Two hundred (200) Wister male rats weighing between (120-150 g) of about 20-25 weeks of age was used. They were obtained from Covenant's feeds Care, Ibadan, Oyo State. The rats were housed in clean metallic cages and kept in a well-ventilated room and allowed to acclimatize to the laboratory condition for one week before being used. They were fed with standard animal pellet and had free access to water ad libitum. The experiments were carried out in accordance with the internationally accepted principles regarding the care and use of animals for experimental techniques.

Carrageenan-induced rat paw oedema: Carrageenan (0.1 ml of 1% w/v) dissolved in distilled water was injected into the sub-plantar region of the right hind paw of rats divided into 6 groups of 5 rats each. Paw size was measured before injection of carrageenan (C0) and at intervals of 1, 2, 3, 4, 5 and 6 hours after carrageenan injection using the cotton thread method. AR (10, 25, 50 and 100 mg/kg), vehicle (10 ml/kg) and indomethacin (10 mg/kg) were orally administered to various groups respectively one hour before carrageenan injection. The mean increase in paw swelling was determined.[9]

Oedema inhibitory activity was calculated according to the following formula.[10]

$$\text{Percentage inhibition} = \frac{(Ct - Co)\text{Control} - (Ct - Co)\text{treated}}{(Ct - Co)\text{Control}} \times 100$$

Where Ct = paw circumference at time t, Co = paw circumference before Carrageenan injection and Ct – Co = Oedema.

STATISTICAL ANALYSIS

The results were expressed as Mean± Standard Error of Mean (SEM) and percentages (%). Statistical analysis of the data was done using Students t-test and one way analysis of variance (ANOVA). Values were of $p<0.05$ were considered significant (Package SPSS 23.0 version).

RESULTS AND DISCUSSION

Carrageenan-induced inflammation AR (10-100 mg/kg) significantly reduced increase in rat paw size with a peak effect of 57.10% observed by the sixth hour at 25 mg/kg. This is comparable to the 57.90% reduction by indomethacin (10 mg/kg) at the fourth hour, by which time AR (50 mg/kg) produced a comparable 52.60% reduction (fig1-fig 6). The result was in agreement with similar report by of Aigbe, *et al*.[1]

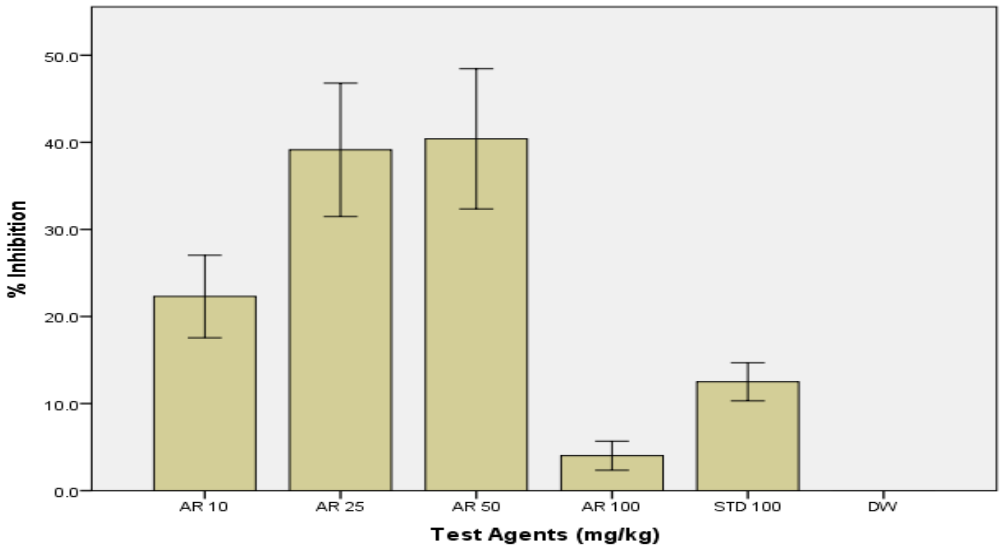

Figure 1: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 1 hour of administration, each value shown in mean ±S.D. (n = 5).). DW (distilled water); AR (Aristolochia ringens); STD (indomethacin).

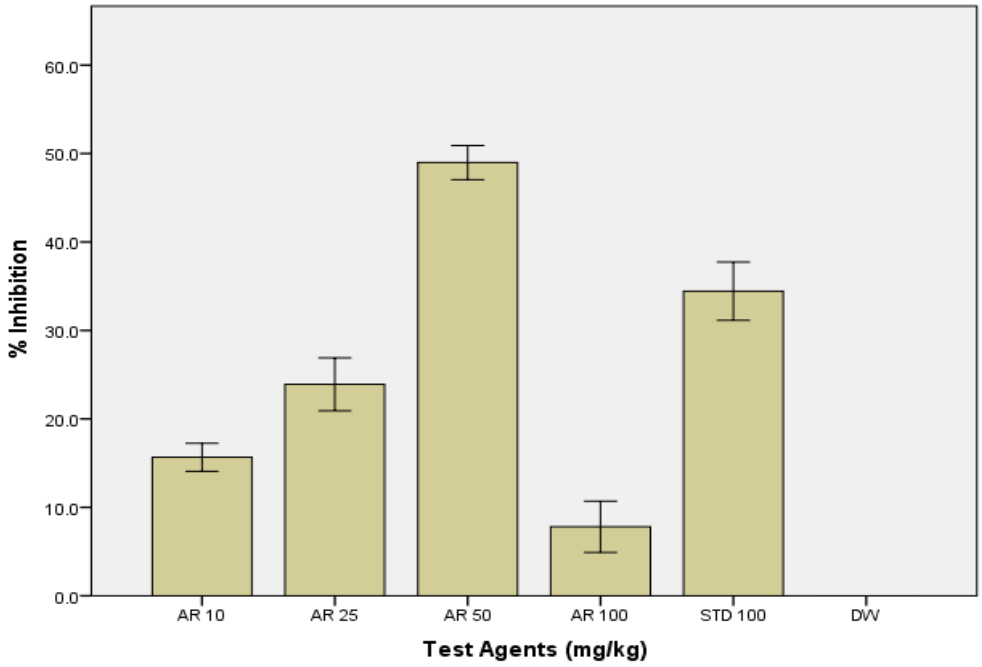

Figure 2: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 2 hour of administration, each value shown in mean ±S.D. (n = 5).). DW (distilled water); AR (*Aristolochia ringens*); STD (indomethacin).

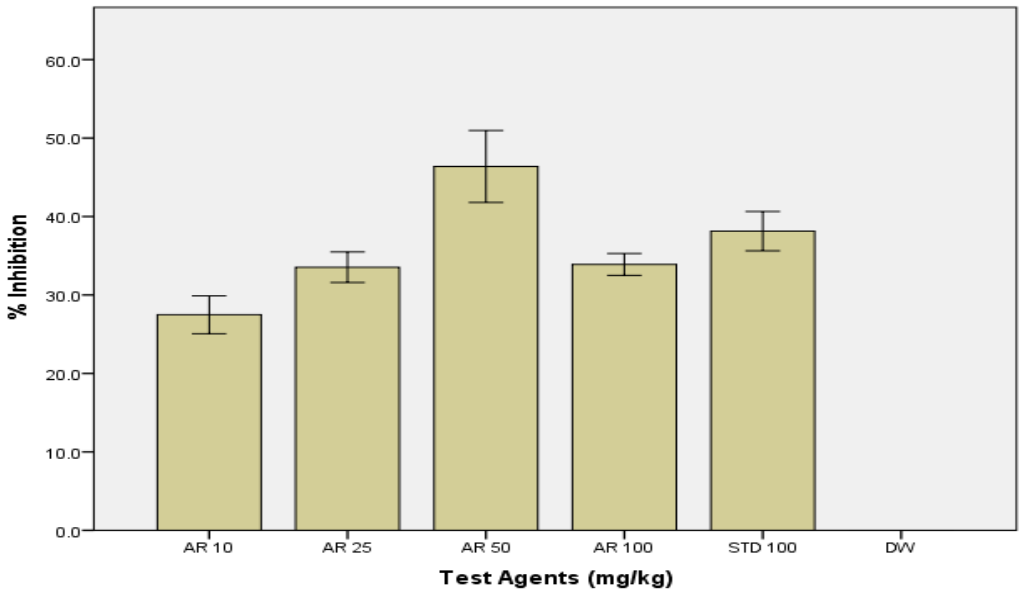

Figure 3: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 3 hour of administration, each value shown in mean ±S.D. (n = 5).). DW (distilled water); AR (Aristolochia ringens); STD (indomethacin).

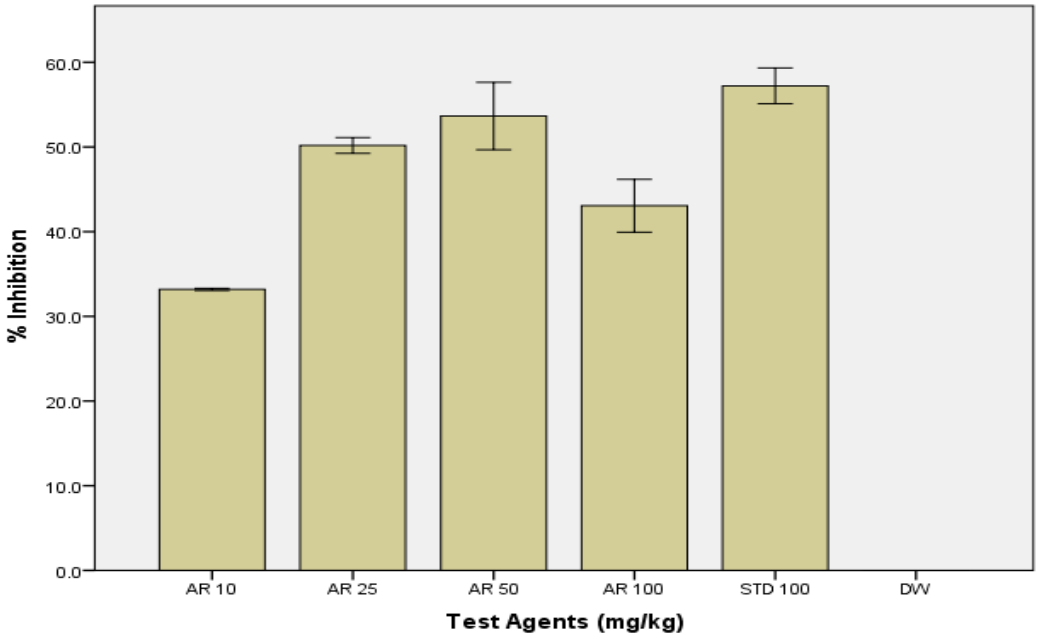

Figure 4: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 4 hour of administration, each value shown in mean ±S.D. (n = 5).). DW (distilled water); AR (Aristolochia ringens); STD (indomethacin).

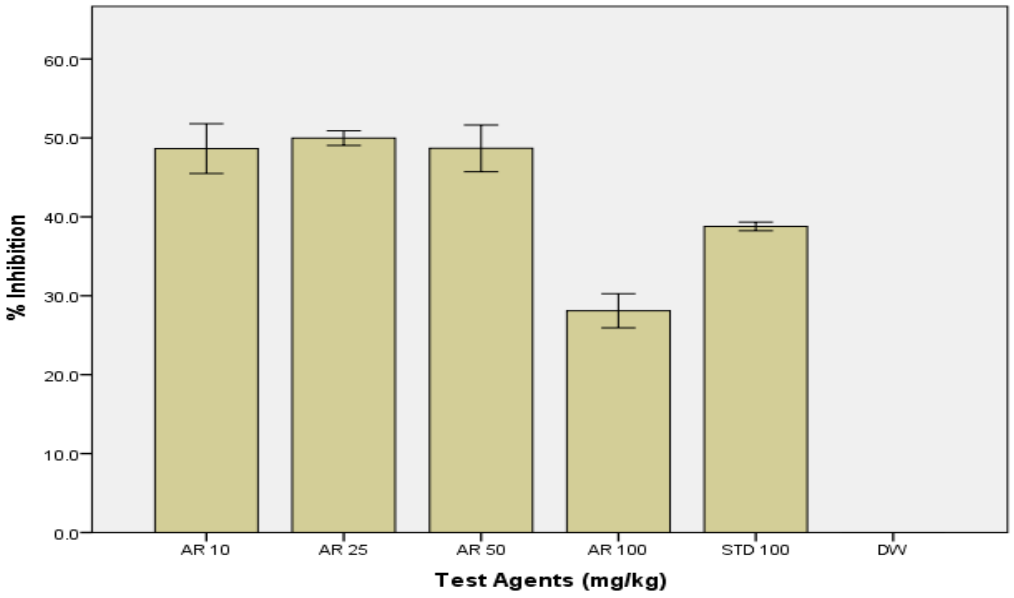

Figure 5: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 5 hour of administration, each value shown in mean ±S.D. (n = 5).). DW (distilled water); AR (Aristolochia ringens); STD (indomethacin).

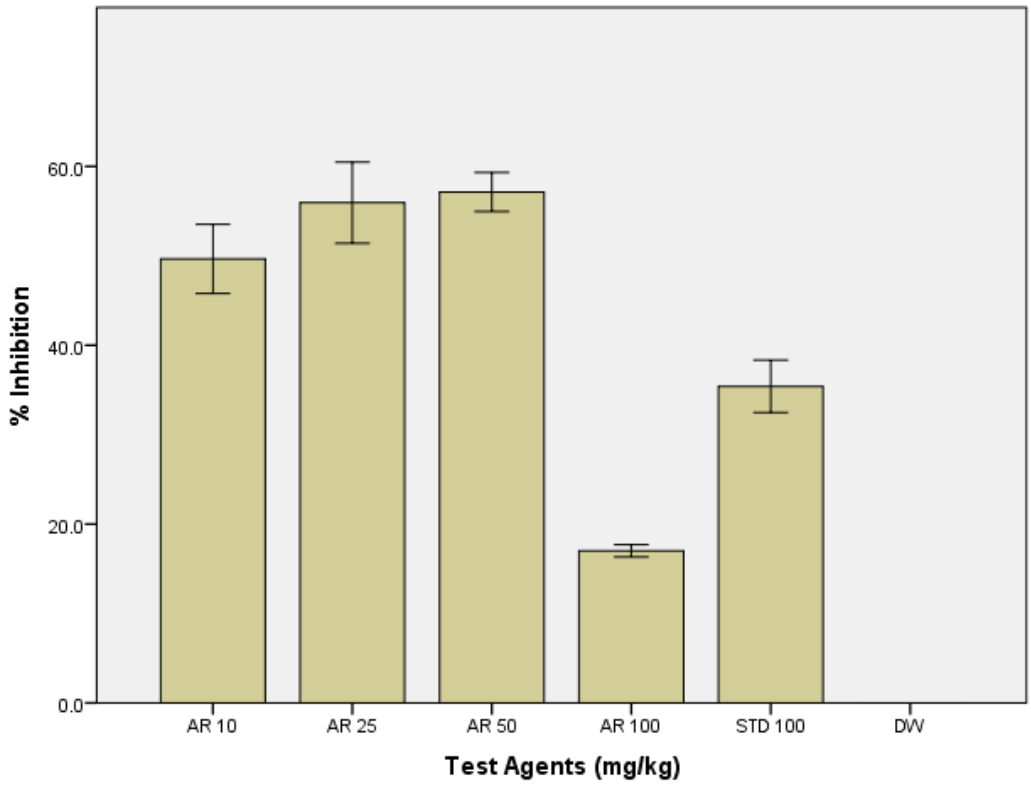

Figure 6: Effects of Test Agents on Carrageenan-induced Rat paw Oedema after 6 hour of administration, each value shown in mean ±S.D. (n = 5). DW (distilled water); AR (*Aristolochia ringens*); STD (indomethacin).

The most widely used primary test to screen new anti-inflammatory agents' measures the ability of a compound to reduce local oedema induced in the rat paw by injection of an irritant agent.[11] Carrageenan-induced oedema has been commonly used as an experimental model for acute inflammation and is believed to be biphasic. The early phase (1-2 h) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the surrounding damaged tissues. On the other hand, the late phase is sustained by prostaglandins and mediated by bradykinin and leukotrienes, produced by tissue macrophages.[12] The results obtained with this model indicate that *Aristolochia ringens* aqueous extracts may also exert its anti-inflammatory activity through the inhibition of neutrophil infiltration, prevention of free radical generation, and/or enhancement of free radical scavenging. AR (10-50 mg/kg) also appears to possess a relatively longer duration of action than indomethacin as it produced significant and greater percentage inhibition up to the 6th hour. This strongly agrees with the work of Aigbe, et al.[1] These results show that the aqueous root extract of *A. ringens* aqueous extracts is active against phlogistics-induced inflammation and provides a basis for the reported efficacy of *A. ringens* in traditional herbal medicine for relief of inflammatory conditions.

CONCLUSION

The results showed that aqueous of *A.ringens* possesses significant anti-inflammatory activity comparable to that of indomethacin. This supports its use as a potent anti-inflammatory drug in herbal medicine.[6]

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).

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