Original article

Antiarthritic activity of *Vernonia amygdalina* in albino rats

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Received April 30, 2009; *Accepted May* 29, 2009

Abstract

Objective: To evaluate the antiarthritic activity of water extract of leaves of *Vernonia amygdalina* (V. A.) on arthritis induced model of rats. **Methods**: Arthritis was induced in male albino Wister rats by injection of croton oil (0.1 mL) into the left foot pad of the animals. Treatment with V. A. at 200 and 400 mg/kg and standard Indomethacin (0.3 mg/kg) was started on the same day and continued up to the 12th day. The paw volume was measured on the 1st, 5th, 12th and 21st day, respectively for both the paws and anti-arthritic activity was evaluated. **Results**: The extract of V. A. produced reduction in the inflammation of the paw due to croton oil. The antiarthritic action started on the 5th day and continued till the 12th day and the activity was comparable to that of the standard on both days. V. A. significantly inhibited adjuvant induced arthritis and had significant ant-inflammatory effect ($P<0.05$). **Conclusion**: This report therefore clearly showed that V. A. significantly inhibited adjuvant induced arthritis in rats as it significantly reduced the paw volume on the 12th day and may explain the effectiveness of this plant when used in the tropics for the treatment of arthritis.

Keywords: *Vernonia amygdalina*; Antiarthritic effect; Croton oil

INTRODUCTION

Vernonia amygdalina (V. A.) (bitter leaf) is a small shrub with green leaves, a characteristic ordour and bitter taste. It contains alkaloids and flavinoids [1]. The leaves soaked in water have been used to treat various diseases such as fever and to increase bowel movement. In folk medicine it has been used to treat malaria, diabetes and inflammatory diseases [2]. Rheumatoid arthritis (RA) is a chronic autoimmune diseases in which there is inflammation of joints, sinovial proliferation and destruction of articular cartilage [3]. Although a number of drugs such as steroids [4-7] and non steroids [8-11] being used in the treatment of RA have been developed in the past few decades, there is still and urgent need for more effective drugs with lower side effects [12]. This study therefore investigates the antiathritic activity of extract of V. A.

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MATERIALS AND METHODS

Male albino Wister rats weighing between 150 – 250 g were used for the present study. The animals were maintained under standard environmental conditions and were fed with standard diet of growers mash supplied by Gee Pee Nigeria Ltd., and had access to clean drinking water *ad libitum*. Croton oil was obtained from Serva Feibiochemica, Heldelberg, Germany. Indomethacin was purchased from Pfizer Nigeria.

Preparation of the plant extract

The fresh leaves of the plant V. A. were dried in the

open air shade for a period of about four weeks prior to extraction process. The water extract of the plant was obtained by procedure in accordance with the general process, described in the USPXIII to yield an extract of 4.0 % w/v, which was used in the experiment. Inflammation was induced using the method [13-15] with slight modification.

Acute toxicity studies

Acute toxicity studies were carried out following Origination for Economic Operation and Development (OECD) guidelines[16] and was found to be safe up to 1 000 mg/kg body weight in albino Wister rats.

Antiarthritic activity

Antiarthritic activity of V. A. was studied using croton oil induced arthritis model [17]. Thirty rats were randomly divided into five groups with six animals each and treated for 12 days. Group I served as normal control, Group II as arthritic control, Group III as standard which received 10 mg/kg Indomethacin (P. O), Group IV and V received 200 mg/kg and 400 mg/kg of V. A. orally respectively and served as test groups.

All the animals except normal control group were injected with 0.1 mL croton oil in the subplantar region of the left hind paw.

On the 1st day, paw volume of all the animals were measured the treatment with standard drug and V. A. started on the same day and continued till the 12th day. The paw volume was measured on the 5th day and the12th day. The edema rate (ER) and inhibition rate (IR) of each group was calculated as following [9].

$$ER\% = \frac{Vt - Vo}{Vo} \times 100$$

Where Vo is the volume before croton oil injection (mL); Vt the volume on the t day after croton oil injection (mL)

$$IR\% = \frac{Ec - Et}{Ec} \times 100$$

Where Ec is the edema rate of control group and Et is the edema rate of treated group.

Statistical analysis

The results are expressed as mean + SEM the data were analyzed by one way analysis of variance (ANOVA).

RESULTS

On the 5th day, there was no significant reduction in percentage of ER compared to arthritic control in all treatment groups. On the 12th day, there was a significant reduction in percentage of ER of both groups with 200 and 400 mg/kg V. A. respectively compared to the arthritic control ($P < 0.05$) (Table 1). None of the animals showed signs of development of secondary lessons.

The antiarthritic activity of V. A. at both doses were comparable to that of the standard (Indomethacin) on the 12th day. Percentage of ER in the non injected paw was also reduced significantly in groups with 200 mg/kg and 400 mg/kg V. A. compared to the arthritic control on the 12th day ($P < 0.05$). IRs at both doses were found to be higher than the standard group on the 5th day, whereas on the 12th day, IR at both doses were compared to that of the standard group.

Table 1 Antiarthritic activity of V. A. (%, ER).

Treatment	Left paw (Injected)		Right paw (Non-injected)	
	5th day	12 th day	5th day	12 th day
Normal control	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Arthritic control	100.00 ± 0.00	400.00 ± 10.00	0.00 ± 0.00	150.00 ± 10.00
Standard indomethacin(10mg/kg)	116.00 ± 10.00	100.00 ± 10.00[a]	25.00 ± 10.00	16.66 ± 10.00
P. K. (200 mg/kg)	170.00 ± 12.00	270.00 ± 10.00[a]	0.00 ± 0.00	60.00 ± 8.00
P. K. (400 mg/kg)	170.00 ± 12.00	90.00 ± 10.00[a]	0.00 ± 0.00	16.00 ± 8.00

[a] $P < 0.05$

DISCUSSION

Inflammatory response induced by croton oil represents a widely used model in assessing anti inflammatory activity of various substances [18,19]. The method is simple, rapid and repeatable. This model therefore allowed for investigation of the therapeutic efficacy of V. A. All animals tolerated the experimental procedure and no death was recorded till the end of the experiment. The dosage selection was based on acute toxicity studies.

V. A. significantly inhibited the development of arthritis induced by croton oil in rats for 12 days ($P < 0.05$). The effect of V. A. was dose dependent. The reduction in the paw volume of the treatment groups provides an adequate index for the antiarthritic activity of V. A. This report therefore clearly showed that V. A. significantly inhibited adjuvant induced arthritis in rats as it significantly reduced the paw volume on the 12th day. Further clinical trials are hereby suggested to corroborate this report.

ACKNOWLEDGEMENT

The authors are grateful to Prof. R. N. P. Nwankwoala for his correction, Tubobelem for secretarial assistance and Matilda for technical assistance.

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Exacutive Editor: Beijia Tan