

Anti-Inflammatory Activity of Aerial part of *Balanites aegyptiaca* (L.) Del against Carrageenan induced Paw Oedema

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Abstract: *Balanites aegyptiaca* (L.) Del has been used in a variety of folk medicines in India and Asia. In the present study, aerial part of *Balanites aegyptiaca* (L.) Del was extracted with ethanol and evaluate for their anti-inflammatory activity in rat using a carrageenan induced paw oedema method. Ethanol extract exhibits potent anti-inflammatory activity at 200 mg/kg 3 hrs. after administration in compare with reference standard, Indomethacin. Observed pharmacological activities provide the scientific basis for the folkloric use of the plant in treating acute inflammation.

Key Words: *Balanites aegyptiaca*, Anti-inflammatory, Carrageenan.

Introduction

Balanites aegyptiaca (L.) Del belongs to the family Balanitaceae. It is an evergreen xerophytic tree of tremendous medicinal importance. It is distributed throughout the dried parts of India. *B. aegyptiaca* has been used in a variety of folk medicines in India and Asia. Various parts of the plants are used in Ayurvedic and other folk medicines for the treatment of different ailments such as syphilis, jaundice, liver and spleen problems, epilepsy, yellow fever and the plant also has

insecticidal, anthelmintic, antifeedant, molluscicidal and contraceptive activities¹. Significant anti-inflammatory activity was evaluated in methanolic and ethanolic extracts of the bark of *B. aegyptiaca* in two different animal models². A wide variety of plants with potent anti-inflammatory activity are used in folk medicines. The search for safe and effective anti-inflammatory drugs through the evaluation of medicinal plants known to be use in the treatment of inflammation disorder is continued even today.

The purpose of the present study was to evaluate the possible anti-inflammatory activity of aerial part of ethanol extract of *B. aegyptiaca* using the carrageenan-induced oedema test. Producing carrageenan-induced inflammation in the rat hind paw (acute inflammation) is a useful method for screening potential anti-inflammatory agents³.

Materials and Methods

Plant material

The aerial part of *Balanites aegyptiaca* (L.) Del. collected from Vadavalli, Coimbatore, Tamil Nadu. The plant was identified with the help of local flora and authenticated in Botanical Survey of India, Southern Circle, Coimbatore, Tamil Nadu, India. A voucher specimen was deposited in Ethnopharmacology unit, Research Department of Botany, V.O.Chidambaram College, Tuticorin, Tamil Nadu.

Preparation of plant extract for anti-inflammatory activity

The aerial part of *Balanites aegyptiaca* (L.) Del. were cut into small pieces, washed, shade dried at room temperature and the dried aerial parts was powdered in a Wiley mill. Hundred grams of aerial part powdered was packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extracts were concentrated in a rotary evaporator. The concentrated ethanol extract was used for anti-inflammatory activity.

Animals

Adult Wistar albino rats of either sex (150-200g) were used for present investigation. Animals were housed under standard environmental conditions at temperature (25±2°C) and light and dark (12:12 h). Rats were feed standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water *ad libitum*.

Acute toxicity study

For toxicity studies, six Albino rats of either sex were administered orally with the test substance in the range of doses 200-2000 mg/kg and the mortality rates were observed after 72h. The ethanol extract of *Balanites aegyptiaca* (L.) Del. has shown no mortality at 2000 mg/Kg. Therefore 2000mg/Kg dose was considered as LD₅₀ cut off dose (safe dose). So 1/20 and 1/10 of that were selected (100 and 200 mg/Kg) for the experiment as sub maximal and maximal dose.

Anti-inflammatory activity

Carrageenan-induced hind paw oedema

Albino rats of either sex weighing 150-200 grams were divided into four groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline 0.5 ml/Kg), Group II and III - *Balanites aegyptiaca* (100 mg/kg and 200 mg/kg, p.o.) respectively and Group IV - Indomethacin (10 mg/kg, p.o.). All the drugs were administered orally.

After one hour of the administration of the drugs, 0.1 ml of 1% W/V carrageenan solution in normal saline was injected into the subplantar tissue of the left hind paw of the rat and the right hind paw was served as the control. The paw volume of the rats were measured in the digital plethysmograph (Ugo basile, Italy), at the end of 0 min., 60 min., 120 min., 180min., 240min., 360min., and 480min. The percentage increase in paw oedema of the treated groups was compared with that of the control and the inhibitory effect of the drugs were studied. The relative potency of the drugs under investigations was calculated based upon the percentage inhibition of the inflammation.

Percentage inhibition

$$\frac{\text{Control (\% increase in paw volume in 3}^{\text{rd}} \text{ hour)} - \text{Test (\% increase in paw volume in 3}^{\text{rd}} \text{ hour)}}{\text{Control (\% increase in paw volume in 3}^{\text{rd}} \text{ hour)}} \times 100$$

Statistical analysis

The data were analyzed using student's t-test statistical methods. For the statistical tests a p values of less than 0.01 and 0.05 was taken as significant.

Results

In the present study, the anti-inflammatory activity of ethanol extract of aerial part of *Balanites aegyptiaca* was assayed in Albino rats using carrageenan-induced rat paw oedema (acute inflammation) method. Table 1 shows that the anti-inflammatory activity of ethanol extract of aerial part of *Balanites aegyptiaca* significantly inhibited the rat paw oedema at 3rd hr post carrageenan were 57.92% and 64.46% for 100 and 200 mg/kg of ethanol extract of *Balanites aegyptiaca* respectively. This results indicated that ethanol extracts with a dose of 200mg/kg body weight showed a maximum anti-inflammatory activity is similar to the reference drug indomethacin, which showed 56.86% of inhibition.

TABLE. 1. ANTI-INFLAMMATORY ACTIVITY OF ETHANOL EXTRACT OF AERIAL PART OF *BALANITES AEGYPTICA* (L.) DEL AGAINST CARRAGEENAN-INDUCED PAW OEDEMA IN ALBINO RATS

Oedema volume (ml)						% Inhibition after 180 min
Treatment ³	Dose mg/kg	0 min	60 min	120 min	180 min	
CONTROL (Group-I)	Normal saline	36.05±1.58	71.13±2.31	92.54±3.91	119.56±7.33	—
Group II	100 mg/kg(LD)	22.31±2.24*	30.33±2.16**	56.34±2.67**	50.31±2.96**	57.92
Group III	200 mg/kg(HD)	16.31±0.93**	23.56±1.96**	51.05±2.13**	42.51±2.92**	64.46
Indomethacin (Group-V)	10 mg/kg	26.56±1.04*	30.96±1.16**	48.53±2.09**	51.57±1.94**	56.86

* $p < 0.05$, ** $p < 0.01$ when compared to control

Discussion

Oedema represents the early phase of inflammation in carrageenan induced paw oedema and is the simplest and most widely used acute inflammatory model for studying anti-inflammatory agents. Carrageenan-induced inflammation is useful in detecting orally active anti-inflammatory agents^{4,5}. The development of carrageenan-induced oedema is believed to be biphasic⁶. The initial phase is attributed to the release of histamine and serotonin. The oedema produced at the peak 3^{hr} is thought to be due to the release of Kinin-like substances, especially bradykinin⁷. The second phase of oedema is due to the release of prostaglandins, protease and lysosomes and it is sensitive to most anti-inflammatory drugs^{4,6}. Results of the present study are suggesting that the drugs under investigation predominantly inhibit the release of prostaglandin like substances. Similar results has already been observed in *Jatropha gossypifolia*⁸, *Bambusa vulgaris*⁹, *Tabernaemontana catharinensis*¹⁰ and *Tagetes erecta*¹¹.

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This study reports for the first time to our knowledge that ethanol extract of aerial part of *Balanites aegyptiaca* has anti-inflammatory activity. Acute toxicity study was observed that the ethanol extract of aerial part of *Balanites aegyptiaca* did not show any behavioral changes or mortality even at a dose of 2000 mg/kg and indicative of the safety of this extract. Further studies may reveal the exact mechanisms of action responsible to treat for the analgesic and anti-inflammatory activities. Though the study has highlighted the anti-inflammatory activities of ethanol extract of aerial part of *Balanites aegyptiaca* could be a potential new natural source as well as scientific proof of its ethnopharmacological use in inflammatory disorders.

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