

## ANTI-INFLAMMATORY SCREENING OF *JATROPHA CURCAS* ROOT, STEM AND LEAF IN ALBINO RATS

B.S. NAYAK<sup>1</sup>, K.N. PATEL<sup>2</sup>

Anti-inflammatory activity of *Jatropha curcas* L. alcoholic extract of root, stem and leaf was confirmed in Albino rats. The alcoholic extract of root, stem and leaf exhibited systemic and significant anti-inflammatory activity in acute carrageenan-induced rat paw edema. From all the alcoholic extracts, the root showed significant reduction in percentage of inflammation over the other alcoholic extracts. It is evident that, in the phasic phenomenon, first inflammatory mediators *i.e.* histamine and serotonin releases at 0–2 hr contribute to inflammation antagonized by the alcoholic extract of root (70%), stem (42.5%) and leaf (50%). Kinin release in the second phase at the 3<sup>rd</sup> hr. is also called plateau phase that was inhibited significantly by the alcoholic extract of root (80.64%), stem (45.16%) and leaf (54.83%). Prostaglandin released as third phase. At 4<sup>th</sup> hr, all the alcoholic extracts showed significant inflammatory effects but lesser as compared to standard.

**Key words:** *Jatropha curcas*, Anti-inflammatory and carrageenan.

### INTRODUCTION

*Jatropha curcas* L. (Euphorbiaceae) is a soft-wooded shrub, commonly grown in rural areas in India. The oil of this plant is used for manufacture of various household commodities and industrially useful products. It is also used traditionally for the treatment of sciatica, dropsy, paralysis, rheumatism, dysentery, diarrhea and certain skin diseases (Anonymous, 2001; Desai, 1975; Dymock *et al.*, 1976; Nadkarni, 1976; Agarwal, 1986; Ambasta, 1986). Recently, based on ethnobotanical practice the root extract of this plant was investigated for antidiarrheal activity in albino mice. The proposed mechanism of action was through a combination of inhibition of elevated prostaglandin biosynthesis and reduction in propulsive movements of small intestine (Mujumdar *et al.*, 2000). The roots of this plant are applied locally in paste form after crushing for the treatment of inflammation by Bhil tribes from Rajasthan area in India on empirical basis (Joshi, 1995). Considering the above information, these roots were collected

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<sup>1</sup> Bhavesh S. Nayak, correspondence author, Dept. of Pharmacognosy, Vidyabharti Trust College of Pharmacy, Umrakh, Gujarat, India, b\_s\_nayak@yahoo.co.in, Mob: 09824543094.

<sup>2</sup> Principal, Arihant School of Pharmacy and Bioresearch Institute, Adalaj, Gandhinagar, Gujarat, India.

locally and their extracts were evaluated for local and systemic anti-inflammatory activity using various animal models in the present investigation.

#### MATERIAL AND METHODS

*Plant material.* Roots, stems and fresh mature leaves were collected from fully-grown plants from fields near the outskirts of Bardoli city. The authenticity was established by comparing its morphological and microscopical characters with the available literature (Kirtikar and Basu, 1999) and by a taxonomist of Veer Narmad South Gujarat University, Surat. and voucher specimen (VBT 01) was deposited at the Dept. of Pharmacognosy, Vidyabharti Trust College of Pharmacy, Umraikh, Bardoli. The root, stem and leaves were coarsely powdered and subjected to successive solvent extraction in soxhlet apparatus using alcohol. These extracts were concentrated for further studies at reduced temperature and pressure in a rotary evaporator. Yields were 24.8 % w/w, 27.4 %w/w and 36.89 %w/w, respectively.

*Animal selection.* Albino rats of either sex weighing 150 to 200 g were selected for the experiment. They were employed for assessing anti-inflammatory activity. Rats were divided into five groups, each group having six animals. The bedding material of the cages was changed every day.

*Dose selection.* Root extract: 200 mg/kg body weight (p.o.)

a) Stem extract: 200 mg/kg body weight (p.o.)

b) Leaf extract: 200 mg/kg body weight (p.o.)

c) Control: 5 ml/kg body weight 1% CMC (p.o.)

d) Standard (Diclofenac sodium): 100 mg/kg body weight (i.p.)

e) 0.1 ml of 1% solution of Carrageenan.

*Carrageenan induced paw oedema.* Wister rats of either sex (150–200 g) were housed in standard metal cages. They were provided food and water was freely available. The rats were allowed one-week acclimatization period before the experimental sessions.

The method of Winter *et al.* (1962) was used to evaluate anti-inflammatory activity; the rats were divided into six groups (each group containing 6 animals). The first group served as control and received normal saline only (1ml/kg, orally), the second group of animals served as standard and were administered standard drug diclofenac sodium (100 mg/kg i.p.). The animals of remaining groups were treated with oils at a dose of 5 ml/kg by oral route and alcoholic extract of leaf, stem and root (200 mg/kg, orally).

A mark was made on both the hind paws just below the tibio- tarsal junction so that every time the paw could be dipped in the column of the plethysmograph up to the mark to ensure a constant paw volume. After 30 min of the above treatment an inflammatory oedema was induced in the left hind paw by injecting 0.1 ml solution of Carrageenan, in the planter tissue of all the animals. The paw volume was measured at first hr and followed by every hr till the fourth hr after administration of carrageenan of each group. The difference between the initial and subsequent reading gave the actual edema volume.

Per cent inhibition of inflammation was calculated using the formula,

$$\% \text{ Inhibition} = 100 (1 - vt/vc)$$

where 'vc' represents edema volume in control and 'vt' edema volume in group treated with test compound.

The data were analyzed using Student's 't' test and the level of significance was set at  $P < 0.005$ .

Table 1

Anti-inflammatory activity of alcoholic extract of different parts of *J. curcas*

Group	Mean paw edema volume in MI+ SEM				
	1 hr	2 hr	3hr	4hr	5 hr
Control	0.4825±0.2232	0.54±0.2046	0.40±0.2622	0.31±0.3616	0.18±0.3803
Standard (Diclofenac Sodium)	0.28±0.1009**	0.28±0.0883**	0.13±0.1373**	0.09±0.0853**	0.02±0.0465**
Alcoholic Extract of Root	0.27±0.1293**	0.27±0.2212**	0.12±0.2186**	0.06±0.2071**	0.03±0.2874**
Alcoholic Extract of Stem	0.3825±0.3438**	0.33±0.2923**	0.23±0.3251**	0.17±0.3703**	0.10±0.2812**
Alcoholic Extract of Leaf	0.2875±0.1819**	0.3025±0.0987**	0.20±0.2157**	0.14±0.1373**	0.09±0.1883**

SEM = standard error of mean, N = 6, \*\* =  $P < 0.005$

Table 2

Percentage (%) inhibition of paw edema

Group	Percentage (%) inhibition of paw edema			
	1 hr	2 hr	3hr	4hr
Standard (Diclofenac Sodium)	48.14815	67.5	70.96774	88.88889
Alcoholic Extract of Root	50	70	80.64516	83.33333
Alcoholic Extract of Stem	38.88889	42.5	45.16129	44.44444
Alcoholic Extract of Leaf	43.98148	50	54.83871	50

## RESULTS AND DISCUSSION

The search for a new anti-inflammatory agent from the vast array holds promise for the discovery of therapeutic agents with beneficial effects not only in the suppressing relevant aspects of the anti-inflammatory cascade but also on the diverse disease conditions where the inflammatory response is amplifying the disease process. This present study was carried out to assess the validity of the folkloric use of this plant in the management of pain and treatment of inflammatory disorders. Both *in vivo* and *in vitro* methods are available for the evaluation of anti-inflammatory agents but among the *in vivo* methods carrageenan induced rat paw oedema assay is believed to be one of the most reliable and also the most widely used. Carrageenan is a mixture of polysaccharides composed of sulfated galactose units and is derived from Irish Sea moss, *Chondrus crispus*. Its use as an edemogen was introduced by the Winter *et al.* 1962. The oedema, which develops in rat paw after carrageenan injection, is a biphasic event. The initial phase is attributed to the release of histamine and serotonin, the oedema maintained between the first and second phase to release the kinin like substance and the third phase to release prostaglandin like compound at 4<sup>th</sup> hr (Winter *et al.* 1962, Larson 1983). Oral route of administration of drug is a common approach to administer the drug. For which carrageenan-induced paw inflammation has been accepted as a useful phlogistic tool for investigating a systemic anti-inflammatory agent. The extract showed time-dependent inhibitory activity in carrageenan-induced paw inflammation over a period of 4h. This indicates action against release of histamine, serotonin and kinins in early phase, while the later phases are suspected to be arachidonate metabolites producing an edema dependent on mobilisation of neutrophils (Just *et al.*, 1998), as stated in Table 1 & 2 and Figure 1. The extract of various parts of *Jatropha curcas* showed a significant inhibition in inflammation. Of all the alcoholic extracts, the root showed a significant reduction in percentage of inflammation over the other alcoholic extracts. It is evident that, in the phasic phenomenon, first inflammatory mediators *i.e.* histamine and serotonin releases at 0-2 hr contribute to inflammation antagonized by the alcoholic extract of root (70%), stem (42.5%) and leaf (50%). Kinin release in the second phase at the 3<sup>rd</sup> hr. It is also called plateau phase that was inhibited significantly by the alcoholic extract of root (80.64%), stem (45.16%) and leaf (54.83%). Prostaglandin release as third phase. At 4<sup>th</sup> hr, all the alcoholic extracts showed significant inflammatory effects but lesser as compared to standard. Inhibitory effects at the end of 4<sup>th</sup> hr could be due to inhibition of prostaglandins synthesis via inhibition of enzyme cyclooxygenase.

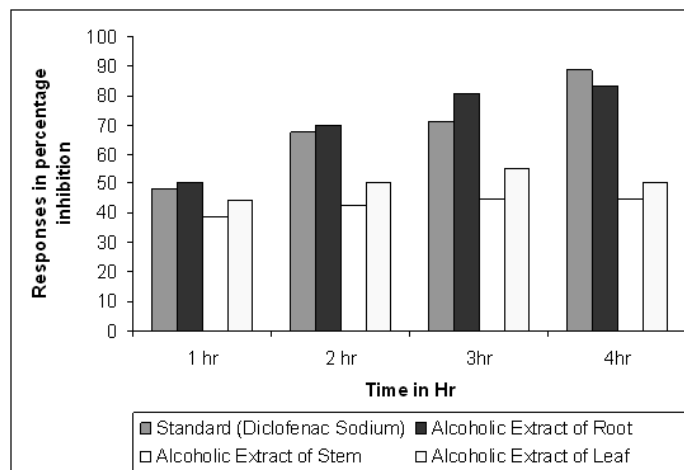


Fig. 1. Percentage (%) inhibition of paw edema.

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