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SCREENING OF DIFFERENT PARTS OF *JATROPHA CURCAS* FOR ANTINOCICEPTIVE AND ANTIPYRETIC ACTIVITY ON RATS

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Jatropha curcas is an ornamental, medicinal and multipurpose shrub belonging to the family Euphorbiaceae. Different parts of Jatropha have been used traditionally to cure various diseases like fever, rheumatism, jaundice and bacterial infection. In this present work alcoholic extracts of leaves, stems and roots of J. curcas (200 mg/kg) were evaluated for its antinociceptive and antipyretic activity in rats. The alcoholic extracts of stems and roots showed significant analgesic activity and they also produced significant reduction in yeast induced pyrexia. The alcoholic extract of roots exhibited analgesic activity without alteration in peak effect and significant reduction in pyrexia that was comparable to standard drugs pantazocine and paracetamol respectively.

Keywords: *Jatropha curcas, Antipyretic, Antinociceptive, Tail flick*

INTRODUCTION

Jatropha species belong to the family Euphorbiaceae and are used in traditional folklore medicine to cure various ailments in Africa, Asia and Latin America (Chopra, Nayar and Chopra 1956; Martinez 1959; Burkill 1994). *Jatropha curcas* is an ornamental, medicinal and multipurpose shrub grown in home gardens in West Africa and cultivated extensively in Asia.

The seeds of *J. curcas* or the expressed oil has been used medicinally as a purgative and as a remedy against syphilis. The oil has been used as a source of fuel, for stimulating hair growth and making candles and soap. The viscid sap (latex) is employed for cleaning teeth, to cure sores on the tongues of babies and for toothache (Langdon 1977; Burkill 1994).

The leaves are utilised extensively in West African ethnomedical practice in different forms to cure various ailments like fever, mouth infections, jaundice, guinea worm sores and joint rheumatism (Irvine 1961; Oliver-Bever 1986). The sap and crushed leaves have also shown anti parasitic activity (Fagbenro-Beyioku, Oyibo and Anuforom 1998). The water extract of the branches strongly inhibit the HIV induced cytopathic effects with low cytotoxicity (Matsuse *et al*. 1999). The roots are used in decoction as a mouthwash for bleeding gums, toothache, eczema, ringworm, scabies and to cure dysentery and venereal diseases like gonorrhoea. It is also reported that the root methanol extract exhibit anti-diarrhoeal activity in mice through inhibition of prostaglandin biosynthesis and reduction of osmotic pressure (Oliver-Bever 1986; Mujumdar *et al*. 2001).

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Different parts of Jatropha have been used traditionally to cure various diseases like fever, rheumatism, jaundice and bacterial infection. This study was therefore designed to investigate analgesic and antipyretic activity of different parts of Jatropha.

METHODS

Plant Material and Extraction

Fresh mature leaves, stems and roots were collected from fully-grown plants from fields near the outskirts of Bardoli city in September 2006. The authenticity was established by comparing its morphological and microscopical characters with the available literature (Kirtikar and Basu 1999) and by a taxonomist, Dr. Meenoo Parabia of Veer Narmad South Gujarat University, Surat, India; voucher specimen was deposited at Department of Phamacognosy, Vidyabharti Trust College of Pharmacy, Gujarat, India. The dried powder of leaves, stems and roots were subjected to soxhlet extraction with alcohol. The extract was concentrated and dried on water bath (yield of leaves extract 37%, stems extract 28% and roots extract 25%). In all experiments 200 mg/kg dose of all extract was tested.

Animals

Wistar albino rats of either sex weighing 150 to 200 g were selected for the experiment. The animals were maintained in individual cages under standard laboratory conditions (12:12 h light/dark cycle at 25±2°C). The rats had full access to water and food. The rats were randomly divided into five groups (control group, standard drug group and three test group of *J. curcas)* with each group having six animals. The experimental protocols were subjected to scrutinisation of the Institutional Animal Ethics Committee and cleared by the same under the provision of Committee for the purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Social Justice and Empowerment, Government of India.

Analgesic Activity

The analgesic response of the samples was evaluated using the tail flick method using analgesiometer as described by D'Amour and Smith (1941). The tail withdrawal from the path of heat source i.e. flicking response was taken as the end point. A cut off period of 10–12 seconds was observed to prevent damages to the tail (Schleyerbach 1997). At least three basal reaction times of each rat with a gap of 5 min, to confirm normal behavior of the animal, were taken. The standard (Pantazocine), test and control doses were injected into the animals and the reaction times were noted at 0, 30, 60, 90, 120 and 180 min.

Antipyretic Activity

Yeast induced fever is called pathogenic fever. Its etiology includes production of prostaglandins, which set the thermoregulatory centres at a lower temperature. The antipyretic activity was evaluated using Brewer's yeast-induced pyrexia in rats (Loux, Depalma and Yankell 1972). In the beginning of the experiment, normal rectal

temperature was noted by digital thermometer. Pyrexia was induced by subcutaneous injection of 2 mL/kg of 15% Brewer's yeast suspension in normal saline. The animals were then fasted for the duration of experiment (approximately 24 hrs). After 18 hrs of yeast injection, root, stem and leaf extracts were given orally to all groups except control, which was given 5 mL/kg body weight of 1% carboxy methyl cellulose (CMC) (p.o.). A standard drug group of animals received a paracetamol suspension equivalent to 200 mg/kg body weight (p.o). The rectal temperatures of all the animals were noted at 60 min interval for 4 hrs after inducing the test drug orally. All the temperatures noted were tabulated and difference in the rise of temperature from that of normal temperature was computed. The mean value in each group was calculated.

Statistical Analysis

The results are presented as mean±SEM. Statistical analysis of data was performed using Student's 't' test to study the differences amongst the means (Snedecor and Cochran 1979).

RESULTS

In the present study, alcoholic extract of the stem and root demonstrated significant analgesic activity compared with the standard drug Pantazocine (Table 1). The alcoholic extract of roots exhibited analgesic activity after 30 min of interval that lead to a faster onset of action than other extracts which exhibited analgesic activity after 60 min of time interval. Throughout the study, alcoholic extract of root exhibited its analgesic activity on the principle of fast onset of action and longer duration of action.

Table 1: Effects of alcoholic extracts on thermal stimulus induced pain in rats.

Group	Reaction times (seconds)					
	0 min	**30 min**	**60 min**	**90 min**	**120 min**	**180 min**
Control	1.22± 0.3292	2± 3347	2.10± 0.1122	3± 0.1720	3.33± 0.1776	3.90± 0.2
Standard (Pantazocine)	2.06± 0.28*	2.18± 0.1960*	3.24± 0.2088*	3.34± 0.1503*	3.60± 0.0979*	4.15± 0.089*
Alcoholic extract of root	2.24± 0.3544**	3.34± 0.7467**	3.60± 0.3674**	3.9± 0.2702**	4.15± 0.0489**	4.50± 0.3130**
Alcoholic extract of stem	1.92± 0.2059**	2.22± 0.2634**	3.19± 0.1393**	3.41± 0.0663**	3.89± 0.3043**	4± 0.3755**
Alcoholic extract of leaf	2.06± 0.3487#	2.34± 0.0678#	2.68± 0.3742#	3.12± 0.2458#	3.25± 0.3256#	3.60± 0.2478#

Notes: Value are expressed as Mean ± SEM; SEM = standard error of mean, n = 6, * = p<0.05, ** = p<0.005, # = not significant

The alcoholic extract of stem and root of *J. curcas* produced significant reduction in yeast induced pyrexia. An antipyretic effect was time dependent. Alcoholic extract of *J. curcas* root exhibits significant reduction in pyrexia that was comparable to standard drug paracetamol (Table 2).

Table 2: Effects of alcoholic extracts in yeast induced pyrexia in rats.

Group	Temperature (F)					
	0 min	**30 min**	**60 min**	**90 min**	**120 min**	**180 min**
Control	101.16 ±0.4238	101.92 ±0.3023	102.36 ±0.3076	101.7 ±0.1483	101.06 ±0.2379	101 ±0.1949
Standard (Paracetamol)	101.2 ±0.3347*	101.4 ±0.1871*	101.3 ±0.2074*	100.86 ±0.1364*	100.62 ±0.2538*	101.06 ±0.2400*
Alcoholic extract of root	101.12 ±0.1393*	101.28 ±0.0860*	101.28 ±0.0969*	101.02 ±0.1428*	100.76 ±0.2315*	101.24 ±0.2891*
Alcoholic extract of stem	102.66 ±0.2600*	102.62 ±0.3200*	102.32 ±0.2154*	101.92 ±0.1685*	102.22 ±0.3056*	101.54 ±0.2135*
Alcoholic extract of leaf	101.86 ±0.4261#	101.74 ±0.3750#	101.44 ±0.5555#	102.06 ±0.3501#	102.42 ±0.3367#	102.26 ±0.2581#

Notes: Values are expressed as Mean ± SEM; SEM = standard error of mean, n = 6, * = $p<0.05$, # = not significant

DISCUSSION

Thermal injuries precipitate an increase in vascular permeability, proteolysis, systemic inflammatory response and release of chemical mediators which are followed by persistent pain (Hirose *et al.* 1984). It is known that several chemical mediators, i.e., bradykinin and prostaglandin, produce pain in thermal injury and that μ, δ, and κ opiod receptor agonists mediate potent antinociceptive activity in animals subjected to thermal injury (Hirose *et al.* 1984). Since Pentazocine exhibits high affinity for μ1, μ2 and κ1 opioid receptors, it is proposed that Pentazocine may exhibit antinociception against thermal stimulus via these receptors. In the present study alcoholic extracts of root, stem and leaf of *J. curcas* were compared with the effect of Pentazocine. Alcoholic extracts of root and stem gave Pentazocine-like effect. The probable antinociceptive action against thermal stimulus is via the opioid receptor. This is similar to the effect produced by Pentazocine, however further study is required to confirm the mechanism of action.

Antipyretics are agents which reduce elevated body temperature. Regulation of body temperature requires a delicate balance between production and loss of heat, and the hypothalamus regulates the set point at which body temperature is maintained (Clark and Cumby 1975; Zeil *et al.* 1975). Most of the antipyretic drugs exhibit drug action by inhibiting COX-2 expression, thus inhibiting prostaglandin synthesis to reduce elevated temperature. There is no direct evidence to confirm the effect caused by the alcoholic extracts of root, stem and leaves of *J. curcas* in interfering with prostaglandin synthesis in hypothalamus, however further study is required to determine the mechanism of action.

CONCLUSION

The probable antinociceptive (via the apoid receptor) and antipyretic (through interference in prostaglandin synthesis in hypothalamus) activities of the alcoholic extracts of root, stem and leaves of *J. curcas* were studied. Further studies are equired to determine the mechanism of action of both activities.

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