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Elucidation of Analgesic and Antipyretic activities of *Ficus bengalensis linn*. Leaves in rats

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ABSTRACT

The aim of this study was to investigate the analgesic, antipyretic properties of the various (chloroform, ethanol and water) extracts from leaf of *Ficus bengalensis* (Moraceae) in rats. Dose of the different extracts 200mg/kg, i.p. were significantly reduced ($p<0.05$). The analgesic activity of leaf of *Ficus bengalensis* was studied using hot-plate method and tail-immersion method in rats. The antipyretic activity of leaf of *Ficus bengalensis* was studied in Brewer's yeast-induced pyrexia in rats. Ethanolic extract of leaf of *Ficus bengalensis* showed more significant activity, while, chloroform extract and water extract does not showed significant ($p<0.05$) analgesic activity as compared to standard drug using hot-plate method and by tail-immersion method. Extracts obtained were also subjected to evaluate antipyretic activity by yeast induced fevered rats. Aspirin (100mg/kg) was taken as standard drug. Water and chloroform extract showed significant decrease in elevated body temperature, while ethanol extract did not showed a significant ($p<0.05$) decrease in elevated body temperature as compared to standard drug.

KEYWORDS: *Ficus bengalensis*, analgesic, pyrexia, aspirin.

INTRODUCTION

Plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. Earliest description of curative properties of medicinal plants is found in Rig-Veda, Charaka Samhita and Sushrusha Samhita give extensive description on various medicinal herbs (Kirtikar KR et al, 1989 & Medicinal plants of India, 1956). Information on medicinal plants in India has been systematically organized (Eds Satyavati et al, 1976, Eds Satyavati et al, 1987 & Eds Ram et al, 1989). India has an ancient heritage of traditional medicine. The materia medica of India provides a great deal of information on the folklore practices and traditional aspects of therapeutically important natural products.Indian traditional medicines based on various systems including Ayurveda, Siddha, Unani and Homeopathy. The evaluation of these drugs is primarily based on phytochemical, pharmacological and allied approaches including various instrumental techniques such as chromatography, microscopy and others. With the emerging worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, the evaluation of the rich heritage of traditional medicine is essential. In this regard, on such plant is *Ficus bengalensis* Linn. syn. *Ficus banyana* Oken. (Family-Moraceae). The plant is a large evergreen tree distributed all over India from sub himalayan region and in the deciduous forest of Deccan and south India. It is a grown in gardens and road sides for shades (The Wealth of India, 1999, Parrotta et al, 2001). It is a member of four sacred trees *Nalpamara* (*Ksirivrksas*) meant to be planted around the home and temples. It is found throughout the year, grows in evergreen except in dry localities where it is a leafless for a short time. It is hardy and drought-resistant; it withstands mild frost. It is epiphytic when young.

It develops from seeds dropped by birds on old walls or on other trees and is therefore, considered destructive to forest trees, walls and buildings(Chopra R et al, 1958, Warrier P et al, 1996). The tree is commonly found all over India from sea level to an elevation of about 3,000 ft. It is also reported from Sri Lanka, Pakistan now widely cultivated. It is commonly known as Vada in Marathi, Banyan tree in English, Bar in Hindi and as Avaroha in Sanskrit (herbalcureindia.com). The group of four *Ficus*, all yielding latex, according to ayurvedic texts, consist of Nyagrodha (*Ficus bengalensis*), Udumbara (*Ficus glomerata*/*Ficus racemosa*), Plaksha (*Ficus lacor*/*Ficus retusa*) and Ashvattha (*Ficus religiosa*) the bark and leaves of this group are used as astringent, haemostatic, anti-inflammatory, anti-septic; prescribed in diarrhoea, dysentery, and in the treatment of skin diseases, ulcers, vaginal disorders, leucorrhoea, menorrhagia, deficient lactation (C.P. Khare et al, 2004 & Binol F et al, 1995).

The aim of this study was to investigate the analgesic, antipyretic properties of the various (chloroform, ethanol and water) extracts from leaf of *Ficus bengalensis* (Moraceae) in rats.

MATERIALS AND METHODS

Plant material

The leaves plant of *Ficus bengalensis* (Family-Moraceae) were collected from Botanical Garden Of N.B.R.I (National Botanical Research Institute), Lucknow, India in month of September 2010.The plant materials were authenticated by Dr. Sayeeda Khatoon, chemo taxonomist at National Botanical Research Institute, Lucknow and voucher specimens were deposited in the departmental herbarium of National Botanical Research Institute, Lucknow, India for future reference. The fresh leaves was collected and cut into small pieces (2-3 cm), dried in shade under normal environmental temperature for 15-20 days, and homogenized to get a coarse powder. This powder was stored in an air tight container and used for further successive extraction.

Preparation of extracts

The powdered plant material (450 g) was repeatedly extracted in a 5000 ml round bottomed flask with 2000 ml solvents starting with Water, Chloroform, and Ethanol in order to estimate the polarity of active compounds. The extracts were cooled at room temperature and evaporated to dryness under reduced pressure in a rotary evaporator (Didry N et al, 1998).

Animals

Swiss albino rats were weighing (150-240 gm) and albino mice (15-18 gm) were procured from National Botanical Research Institute (Lucknow). They were housed in the departmental animal house under standard conditions (26 ± 2°C and relative humidity 30-35%) in 12 hours light and 12 hours dark cycle respectively for 1 week before and during the experiments. Animals were provided with standard rodent pellet diet and had free excess to water. The composition of diet is 10% protein, 4% arachis oil, 1% fibers, 1% calcium, 1000 IU/gm vitamin A and 500 IU/gm vitamin D. All the animals were acclimatized to the laboratory conditions prior to experimentation. All the experiments were conduct between 10.00 and 17.00 h and were in accordance with the ethical guidelines of the International Association for Study of Pain (Zimmerman M, 1983). All experiments were carried out according to the guidelines for care and use of experimental animals and approved by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

ANALGESIC ACTIVITY

Hot plate method

In this Hot Plate Method, animals from the each group were placed on the hot plate, which is commercially available, consists of an electrically heated surface. Temperature of this hot plate is maintained at 55-56^{o}C and observation is done up to the time until either paw licking or jumping was noted. Then the average basal reaction time was noted before and after 30, 60, 90, and 120 minutes following oral administration of the drugs and test compounds (Vogel, 2002, Jain PS et al, 2007 & Subrat K et al, 2002).

Tail immersion method

Tail immersion method was used to determine the analgesic activity. Rats of wistar strain were randomly divided into a six groups having six animals in each and they were fasted overnight but during the experiment had free access to water. All the extracts were administered orally (100mg/kg) 60 minutes prior to the commencement of the estimation of reaction time. The temperature of the water in the organ bath was set at 55 ± 0.5^{o}C with the help of thermostat. The reaction time was determined by immersing the tail in hot water and the time taken by the rat to withdraw its tail clearly out of water was noted. Observations were repeated at an interval of 30 minutes up to 120 minutes (Hukkeri VI et al, 2004 & Jain PS et al, 2007).

ANTIPYRETIC ACTIVITY

Yeast induced pyrexia method

A suspension of Brewer's yeast (15%) in saline (0.9%) was prepared. Five groups each containing 6 rats of either sex were taken. The thermocouple was inserted 2 cm deep into the rectum and the rectal temperatures were recorded. The animals were fevered by injection of brewer's yeast suspension (10 mg/kg) subcutaneously in the back below the nape of the neck. The sight of injection was massaged in order to spread the suspension beneath the skin. The room temperature was kept at 22-24^{0}c. Immediately after yeast administration, food was withdrawn, and then the rise in rectal temperature was recorded. The measurement

was repeated after 30 minutes. The dose of the test compound and standard drug was given orally. The rectal temperature was recorded again after 30, 60, 120 and 180 minutes. Aspirin (100 mg/kg) was selected as a standard drug. The various extracts were dissolved in saline with the help of Gum acacia (2% w/v) (Hukkeri VI et al, 2004 & Jain PS et al, 2007).

EXPERIMENTAL PROTOCOLS

Treatment was carried out as;

Group I: Control

Group II: Aspirin

Group III-VI: Various extracts of *Ficus bengalensis* leaf (200mg/kg)

STATISTICAL ANAYSIS

The data were analyzed for significance using the unpaired two-tailed student's t-test.

RESULTS AND DISCUSSION

The extracts after preliminary phytochemical investigation was shown the presence of following active principle (Trease GE, Evans WC, 1989).

Chloroform: Sterols, triterpenoids.
Ethanol: Sterols, flavonoids, triterpenoids, tannins, carbohydrates, saponins, alkaloids.
Water: Sterols, flavonoids, triterpenoids, tannins, carbohydrates, saponins, alkaloids.

ANALGESIC ACTIVITY

Hot plate method

Ethanolic extract of leaf of *Ficus bengalensis* shows more significant activity, while, chloroform extract and water extract does not showed significant analgesic activity as compared to standard drug. Results are given in **Table 1**.

Table – 1 Result of various extract of leaf of *Ficus bengalensis* on Hot plate method

Time (min.)	Control (100 mg/mg)	Aspirin (100 mg/kg)	Ethanolic Extract (200 mg/kg)	Water extract (200 mg/kg)	Chloroform extract (200 mg/kg)
0 min	11.3±0.52	31.6±0.66	31.3±0.74*	17.1±0.54	8.3±0.31
30 min	16.9±0.63	22.0±0.52	28.6±0.54	13.8±0.38	11.9±0.43
60 min	10.8±0.32	12.0±0.60	33.4±0.61*	13.5±0.31	9.5±0.10
90 min	10.9±0.47	15.9±0.39	27.5±0.34	15.8±0.41	10.9±0.34*
120 min	12.2±0.57	22.1±0.45	12.3±0.49*	9.4±0.27	11.8±0.36

Values expressed in table are mean ± standard deviation (n=6) in each group, *p<0.05; when compared with control group.

Tail immersion method

Extracts obtained were subjected to evaluate for analgesic activity by tail immersion method using rats as animal model. Aspirin (100mg/kg) was taken as standard drug. Water extract of bark of the *Ficus bengalensis* shows more significant activity, while, chloroform extract and Ethanol extract does not showed significant analgesic activity as compared to standard drug. Results are given in Table2.

Table –2 Result of various extract of leaf of *Ficus bengalensis* on on Tail immersion method.

Time (min.)	Control (100mg/mg)	Aspirin (100 mg/kg)	Ethanolic extract (200 mg/kg)	Water extract (200 mg/kg)	Chloroform extract (200 mg/kg)
0 min	6.4±0.11	6.4±0.11*	8.4±0.08	5.7±0.06	5.6±0.15
30 min	5.4±0.04	8.2±0.07	9.3±0.07	5.4±0.09*	6.4±0.15
60 min	6.2±0.12	9.4±0.15	12.3±0.37	8.6±0.09	7.2±0.11
90 min	7.0±0.09	13.2±0.19	14.3±0.22	8.3±0.14*	9.4±0.11
120 min	6.3±0.07	21.11±0.33	18.0±0.35	6.6±0.12*	13.0±0.78

Values expressed in table are mean ± standard deviation (n=6) in each group, *p<0.05; when compared with control group.

ANTIPYRETIC ACTIVITY

Yeast induced pyrexia method

Extracts obtained were subjected to evaluate antipyretic activity by yeast induced fevered rats. Aspirin (100mg/kg) was taken as standard drug. Water and Chloroform extract showed significant decrease in elevated body temperature, while Ethanol extract did not show a significant decrease in elevated body temperature as compared to standard drug. Results are given in Table 3.

DISCUSSION

In the present work attempts were made to study detail phytochemical investigation and pharmacological action, particularly anti-pyretic and analgesic activity of leaf of *Ficus bengalensis* Linn belonging to family of Moraceae.

The animal was subjected for hot plate and tail immersion analgesic activity. Ethanolic and water extract showed significant analgesic activity by hot plate and tail immersion analgesic activity respectively. The animal was also fevered by injection of Brewer's yeast suspension (10mg/kg) subcutaneously in back below the nape of neck for the antipyretic activity. Water and Chloroform extract showed significant decrease in elevated body temperature. while, Ethanol extract does not showed significant analgesic activity as compared to standard drug. It may be concluded that the extracts of leaf of *Ficus bengalensis* showed analgesic and antipyretic effects, similar to those observed for non-steroidal drug such as aspirin.

Table 3: Results of Effect of various extracts of leaf of *Ficus bengalensis* Linn on yeast-induced pyrexia.

Group	Rectal temperature		Time after administration			
	Initial	18 hr after Yeast injection	30 min	60 min	90 min	120 min
Control	37.91±0.004	39.51±0.21	39.16±0.17	39.33±0.19	38.99±0.04	39.54±0.004
Aspirin	37.75±0.20	39.09±0.61	38.07±0.48	37.59±0.45	37.97±0.54	38.98±0.71
Ethanol	38.19±0.18*	39.19±0.01	39.04±0.22	39.05±0.22*	38.40±0.004	38.38±0.01*
Water	38.02±0.15*	40.43±0.04*	38.65±0.22*	38.77±0.20*	39.33±0.09*	39.38±0.15*
Chloroform	38.38±0.15*	40.09±0.008*	38.29±0.28*	39.26±0.16*	39.51±0.01*	39.03±0.34*

Values expressed in table are mean ± standard deviation (n=6) in each group, *p<0.05; when compared with control group

The phytochemical analysis showed the presence of flavonoids and this might be responsible for anti-inflammatory activity.

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