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EFFECT OF BOTH ANALGESIC & ANTI- INFLAMMATORY ACTIVITY OF BUTEA FRONDOSA LINN LEAVES ON SWISS ALBINO RAT

Parul Rai*[1], Dr. Rajeev Shukla[2] and Diksha Singh[3]

[1]M. Pharm (Pharmacology), SHEAT College of Pharmacy, [2]Director, SHEAT College of pharmacy, [3]Assistant Professor, SHEAT College of Pharmacy, Department of Pharmacology, Sarswati Higher Education & Technical College of Pharmacy, Dr. A. P. J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031.

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***Corresponding Author**
Parul Rai
M. Pharm (Pharmacology), SHEAT College of Pharmacy, Department of Pharmacology, Sarswati Higher Education & Technical College Of Pharmacy, Dr. A. P. J. Abdul Kalam Technical University, Lucknow , Uttar Pradesh, India, 226031.

ABSTRACT

A variety of active constituents with wide range of pharmacological actions have been reported with Butea frondosa linn. The present study was undertaken to assess analgesic and anti-inflammatory properties of its leaf extracts. Dried leaves were ethanol. Extract were evaluated for analgesic activity through, tail flick, tail immersion, and writhing assay tests at doses of 50, 100, and 200 mg/kg using Swiss albino rat. On the other hand, anti-inflammatory assay was performed by carrageenan induced paw edema of ethanol extract at 100 and 200 mg doses in Wistar albino rat. Diclofenac sodium and indomethacin were employed as a standard for analgesic and anti-inflammatory studies, respectively. Our present study demonstrated that Butea frondosa linn bears significant analgesic and anti-inflammatory activities in those models.

KEYWORDS: Butea frondosa, Butea monosperma, Flame of forest, Pharmacology, Palash, Antiinflammatory, Analgesic, Pain, inflammation.

1. INTRODUCTION

Human beings have relied on natural products as a resource of drugs for thousands of years. Plant-based drugs have formed the basis of traditional medicine systems that have been used

for centuries in many countries such as India, Srilanka, Manymar, Thailand, Laos, Cambodia, Vietnam, Malaysia.[1] Today plant-based drugs continue to play an essential role in health care. It has been estimated by the World Health Organisation that 80% of the population of the world rely mainly on traditional medicines for their primary health care.[2] Currently, at least 119 chemicals, derived from 90 plant species, can be considered as important drugs in one or more countries.[3]

It has a inclusive range of active principles like coreopsin, isocoreopsin, sulphurein, butein, butin, isobutrin, monospermoside and isomonospermoside, aurones, chalcones, flavonoids (palasitrin, prunetin) and steroids. Butea frondosa contains phytoconstituents such as alkaloids, flavonoids, phenolic compounds, amino acids, glycosides, steroids etc. The pharmacological activity is primarily shown by flowers, seeds, barks, fruits, leaves etc. The existing review focused on subsequent pharmacological actions like astringent, aphrodiasiac, anti- helmintic, anti-inflammatory anti- bacterial, anti- fungal, anti – asthmatic, hepatoprotective, antifertility, anti-filarial, anti-diabetic, antiviral, anticonvulsant, antifungal, antimicrobial, anti-estrogenic, anticancer, antioxidant, antiulcer, wound healing, anti-diarrhoeal, anti- implantation, anti- dopaminergic, anti-mycobacterial, osteogenic and osteoprotective activity.

Inflammation is that the means that by that the body deals with insult and injury. Insult is also caused: automatically (e.g., by pressure or foreign bodies), with chemicals (e.g., by toxins, acidity, alkalinity), physically (e.g., by temperature), by internal processes (e.g., uremia), and by mircoorganisms (e.g., bacteria, virus, parasites).

Inflammation is often thought of as a swelling, painful or otherwise uncomfortable scenario – maybe in your joints, sinus or internal organ.

1.2 Analgesics[6,7,8,9,10]

Analgesics see a bunch of medication wont to briefly relieve pain. they're generally called painkillers. They block pain signals by ever-changing however the brain interprets the signals and swiftness down the central system. Combining analgesics with alcohol, prescription or banned medicine will produce dangerous and unpredictable effects. Even low doses will impair driving ability. There are 2 main styles of analgesics: non-narcotic and narcotic.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are the most commonly used drugs to treat pain and inflammatory conditions.[4] But they have common side effects like ulcer, bleeding, and renal disorders.[5] Therefore, medicinal plants are the common source of therapeutically active chemical substances with lesser side effects.[6]

Based on the above findings, analgesic and anti-inflammatory activities were evaluated in this present study. These findings justified the traditional use of Butea frondosa linn in the treatment of inflammatory conditions.

2. METHODS

2.1. Plant Material and Preparation of the Extracts

The leaves were collected from RGSC,BHU Barkachha, Mirzapur , Uttar Pradesh , India.

Procedure

The whole plant components were dried in shade and pulverised to urge a rough powder. concerning 800gm of dry coarse powder was extracted with fermentation alcohol (40-600C) by continuous hot percolation victimisation Soxhlet equipment. The extraction was continuing for 72hours. The wood spirit extract was filtered and targeted to a dry mass by victimisation vacuum distillation. A brownness waxy residue obtained. By taking this wood spirit extract the crude oil ether extract were obtained by means that of fractionation. additional the solvents were gaseous to waterlessness so the residue of various extract obtained gaseous to dried mass so the residue of various extract obtained were taken for the experiment.

2.2. Phytochemical Screening

Various phytochemical tests were performed to determine the presence of alkaloids, tannin, Carbohydrates, Glycosides.

Table 1: Phytochemical Screening Test.

Phytochemical parameters	Butea frondosa linn (W/W%)
Total ash	10.16%
Acid-insoluble ash	2.83%
Water-soluble ash	5.16%
Petroleum extractive	2.94%
Chloroform extractive	3.08%
Ethanol extractive	5.06%
Water extractive	10.61%

2.3. Acute Toxicity Studies

The acute oral toxicity studies of the extracts were performed as per revised Organisation for Economic Cooperation and Development (OECD) guidelines 423. Animal ethics committee approval was obtained for animal experiment. The ethanol extracts of whole aerial parts/leaves of Butea frondosa linn was dissolved in water and administered orally to overnight fasted animals at the doses of 250, 500, and 1000 mg/kg of body weight in rat. After administration of the extracts, the animals were observed continuously for the first two hours, for any toxic manifestation. Thereafter, observations were made at regular intervals for 48 hours. Further, the animals were under investigation up to a period of 2 weeks for mortality and general behaviour.[13] All observations were systematically recorded and maintained for each mouse individually.

2.4. Analgesic Activity of Ethanol Extracts in Rat

2.4.1. Experimental Animals Swiss albino rat (18 to 20 gm) of either sex .The animals were maintained under environmental condition and had free access to standard diet and fresh water ad libitum. They were housed in animal cages in an air condition area at 25 ± 2°C with 12 h light and dark conditions. The optimum conditions for experiments were decided on the basis of pilot experiments and carried out using six animals for each group. They were in fasting condition for 18 hours before starting the experiments.

2.4.2. Mouse Writhing Assay According to Koster et al.[14], the total number of writhes was counted after intraperitoneal injection of acetic acid (0.6% V/V in normal saline, 10 mL/kg) for 15 min, starting after 5 min of injection. The extracts were administered orally at 50, 100, and 200 mg/kg doses 30 min prior to acetic acid injection. Number of writhing and stretching was observed and recorded and expressed as percentage inhibition.

2.4.3. Tail Flick Method

A modification of the method originally described by Pizziketti et al.[15] was employed. Rat were closely restrained in a wire mesh cage and the lower half of the tails dipped in cold water (4°C). The time (in seconds) for tail withdrawal from the water was taken as the reaction time. Measurement of threshold was made 30 and 60 min before and after administration of diclofenac sodium (65 mg/kg, subcutaneously) or extracts (50, 100, and 200 mg/kg, per oral), respectively. Distilled water (10 mL/kg) served as the control.

Table 2: Analgesic Effect Of Butea monosperma: Tail Flick method.

Sl. No.	Treatment	Reaction time (second) ± SEM					
		0Min	30 min	60 min	120 min	180min	240min
1.	Control	2.43±0.18	2.22±0.43	2.48±0.38	2.40±0.34	2.50±0.28	2.51±0.28
2.	Diclofenac sodium	2.45±0.25	4.5±0.28*	4.51±0.2*	4.70±0.4*	4.5±0.25*	2.91±0.1*
3.	Petroleum ether extract	2.35±0.14	4.88±0.8*	4.92±0.8*	5.11±0.7*	4.82±0.5*	3.92±0.1*
4.	Ethanolextract	2.52±0.35	3.18±0.4*	4.25±0.4*	5.78±0.6*	4.28±0.4*	4.11±0.3*
5.	Water extract	2.65±0.30	3.00±0.37*	3.12±0.20*	3.50±0.23*	3.21±0.23*	3.15±0.14*

Mean ± SEM, "*" indicates p< 0.05

2.4.4. Tail Immersion Method

Rat were divided into groups of six animals each. The lower 5 cm portion of the tail was immersed in a beaker of water maintained at 55 ± 0.5°C.[16] The time in seconds for tail withdrawal from the water was taken as the reaction time, with a cut-off time of immersion at 10 sec. The reaction time was measured 1 hour before and after oral administration of extracts (50, 100, and 200 mg/kg, per oral) or distilled water (10 mL/kg). Diclofenac sodium (65 mg/kg) was administered subcutaneously, 30 min before the test.

Table 3: Analgesic Effect Of Butea monosperma: Tail Immersion method.

Sl. No.	Treatment	Reaction time (second) ± SEM					
		0 min	30 min	60 min	120 min	180 min	240 min
1.	Control	2.46±0.18	2.26±0.43	2.46±0.38	2.3±0.34	2.56±0.28	2.56±0.28
2.	Diclofenac sodium	2.45±0.25	4.0±0.28*	4.08±0.2*	4.78±0.4*	4.3±0.25*	2.91±0.1*
3.	Petroleum ether extract	2.35±0.14	4.88±0.8*	4.92±0.8*	5.11±0.7*	4.82±0.5*	3.92±0.1*
4.	Ethanolextract	2.52±0.35	3.18±0.4*	4.25±0.4*	5.78±0.6*	4.28±0.4*	4.11±0.3*
5.	Water extract	2.65±0.30	2.68±0.37*	2.98±0.20*	3.15±0.23*	3.91±0.23*	3.58±0.14*

Mean ± SEM, "*" indicates p< 0.05.

2.4.5 Hot plate Method in Rat

The animals were divided into six teams of half-dozen animals every. cluster I served as management. cluster II served as commonplace and were injected nonsteroidal anti-inflammatory drug (9 mg/kg) intraperitonially. cluster III and IV were treated orally with binary compound extract of five hundred mg/kg weight severally. cluster V were treated orally with ether extract and VI were treated orally with alcohol extract of 500mg/kg weight severally. The animals were separately placed on the new plate maintained at 55°C, one hour

when their individual treatments. The time interval was noted because the time at that animals reacted to the pain stimulation either by paw licking or jump response, whichever appeared 1st. The bring to a halt time for the reaction was fifteen seconds.

Table 4: Analgesic Effect Of Butea monosperma: Hot Plate method.

Sl.No.	Treatment	Reaction time (second) ± SEM					
		0 min	30 min	60 min	120 min	180 min	240 min
1.	Control	2.43±0.18	2.22±0.43	2.48±0.38	2.40±0.34	2.50±0.28	2.51±0.28
2.	Diclofenac sodium	2.45±0.25	4.5±0.28*	4.51±0.2*	4.70±0.4*	4.5±0.25*	2.91±0.1*
3.	Petroleum ether extract	2.35±0.14	4.88±0.8*	4.92±0.8*	5.11±0.7*	4.82±0.5*	3.92±0.1*
4.	Ethanol extract	2.52±0.35	3.18±0.4*	4.25±0.4*	5.78±0.6*	4.28±0.4*	4.11±0.3*
5.	Water extract	2.65±0.30	3.68±0.37 *	3.98±0.20 *	4.15±0.23 *	3.91±0.23 *	3.58±0.14 *

Mean ± SEM, "*" indicates p< 0.05.

2.5. Anti-Inflammatory Activity of Ethanol Extract Using Carrageenan Induced Paw Edema in Rats

2.5.1. Experimental Animals Wistar albino rats (150 to 200 gm) of either sex .the animals maintained under environmental conditions had free access to standard diet. They were housed in animal cages in an air conditioned area at 25 ± 2°C with 10/14 h light/dark cycle. The optimum conditions for experiments were decided on the basis of pilot experiments carried out using six animals for each group. They were in fasting condition for 18 hours before starting the experiments. Declofenec sodim was used as standard control.

2.5.2. The ethanol extract of Butea frondosa linn leaves (100 and 200 mg/kg) or indomethacin (10 mg/kg) was administered orally to differentiate groups of rats as shown in Table 6. Acute inflammation was induced half an hour after treatment by subplanter injection of 0.1 mL freshly prepared 1% suspension of carrageenan in right hind paw of rats.[18] The paw volume was measured initially and then at 1, 2, 3, and 4 h after the carrageenan injection by using plethysmographic method.[19]

Table 5: Effect of Butea monosperma on Carrageenan Induced Paw Edema.

Group Time	control	Standard	Pet- ether Extract (250 mg/kg)	Ethanolic Extract (250mg/kg)
0hr	0.71±0.03	0.69±0.07	0.99±0.07	0.95±0.06
1hr	1.18±0.06	0.85±0.06	1.32±0.06	1.2±0.08
2hr	1.30±0.03	0.83±0.06	1.3±0.06	1.18±0.08
3hr	1.35±0.02	0.83±0.06	1.25±0.08	1.17±0.07
4hr	1.37±0.06	0.82±0.06	1.19±0.14	1.13±0.08
%Inhibition of paw edema	-	80.30	69.69	72.72
P value	>0.05*	<0.05***	<0.05**	<0.05***

3. RESULTS

3.1. Acute Toxicity Studies

3.1. No mortality and behavioral changes were observed up to 2 weeks. Therefore, ethanol extracts were safe up to 1000 mg/kg body weight dose. In accordance with this test, Butea frondosa linn was tested at 50, 100, and 200 mg/kg body weight for further experiments.

3.2. Tail Withdrawal Reflexes Induced by Tail Flick Test According to Table 3, both extracts of Butea frondosa linn exerted maximum ~30% inhibition during tail flick method at 200 mg/kg doses, whereas diclofenac sodium showed ~45% inhibition at therapeutic dose (65 mg/kg) in rat. The tail withdrawal reflexes were gradually increased from ~15 to ~30% during oral administration of extracts.

Protective effect of Butea frondosa linn extracts (ethanol and chloroform) on tail withdrawal reflexes induced by tail flick method in rat.

3.3. Tail Withdrawal Reflexes Induced by Tail Immersion Test Tail immersion test is also another parameter for analgesic activity. All three doses of both extracts showed significant inhibition with respect to control. The positive control, diclofenac sodium demonstrated ~50% inhibition at therapeutic dose, whereas both extracts showed ~25% inhibition up to 200 mg/kg dose. According to Table 4, it was evident that both extracts had significant analgesic activity which was slightly lower than diclofenac sodium.

Protective effect of Butea frondosa linn extracts (ethanol and chloroform) on tail withdrawal reflexes induced by tail immersion method in rat.

3.4. Anti-Inflammatory Activity of Ethanol Extract Using Carrageenan Induced Rat Paw Edema in Rats.

The paw volumes and percentages of inhibition by the ethanol extract of Butea frondosa linn and standard drugs are shown in Table 6. Carrageenan injection was administered one hour after treatment of extracts at three doses (50, 100, and 200 mg/kg) and indomethacin. Measurement of paw size was taken before carrageenan injection and then 1, 2, 3, and 4 h after carrageenan injection. It was observed that the ethanolic extract showed significant inhibition at two doses. The inhibition was the highest at 3 h at 200 mg/kg dose which was slightly lower than indomethacin effect.

4. DISCUSSION

This study is the first report related to analgesic and antiinflammatory activity of Butea frondosa linn leave extracts. The analgesic activity was evaluated through acetic acid writhing, tail flick, tail clip, and tail immersion assays in rat, whereas antiinflammatory activity was performed through carrageenan induced paw edema in rats. We did not include the petroleum ether extract for our study because phytochemical screening revealed that there was no secondary metabolites in this extract.

The antinociception activity was evaluated by acetic acid-induced writhing responses. The intraperitoneal administration of acetic acid produced both peripheral and central nociception action which acted through release of endogenous mediators and blocked by nonsteroidal anti-inflammatory drugs.[20] Both extracts showed significant reduction in writhing and stretching induced by acetic acid. Chloroform extract had higher inhibitory action at 200 mg/kg dose which is comparable to standard drug ni (Table 2). Other doses of ethanol extracts also showed significant inhibition % writhing in rat. This action might be due to blockade of the release of endogenous substances.

The brain and spinal cord play an important role in central pain mechanism. The dorsal part of the spinal cord is rich with substance P, endogenous opioids, somatostatine, and other inhibitory hormones which are the targets of pain and inflammation.[21] It is also established that tail clip, tail flick, and tail immersion models are the well-established methods for measuring the central analgesic effects of drugs through opoid receptor.[21] Our present study demonstrated that both ethanol extracts were effective against all these models at 200 mg/kg doses which were comparable with standard drug diclofenac sodium (Tables (Tables33–5). Narcotic analgesics are active against both peripheral and central pain, while nonsteroidal

anti-inflammatory drugs inhibit peripheral pain.[22] Our findings suggested that both extracts may act like narcotic analgesic drugs.

Ethanol extract had significant anti-inflammatory effect against carrageenan-induced paw edema model, whereas chloroform extract had not such effect on rats. Carrageenan induced inflammation is a well-established method to detect orally active anti-inflammatory agents which shows biphasic response. The first phase is mediated through the release of histamine, serotonin, and kinins, whereas the second phase is through the release of prostaglandins.[23] Ethanol extract at 200 mg/kg dose showed maximum inhibition at 2 h (Table 6); this finding signified that anti-inflammatory action might be due to inhibiting the release of histamine or kinins.

5. CONCLUSION

The present study showed significant analgesic effect of both ethanol extracts at 100 and 200 mg/kg doses in rat, whereas ethanol extract at 200 mg/kg dose had anti-inflammatory effect. We reported for the first time analgesic and anti-inflammatory effect of Butea frondosa linn in various models.

6. ACKNOWLEDGEMENT

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