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ORIGINAL ARTICLE

Investigations of Phytochemical, Analgesic, Anti-Inflammatory and Antipyretic Effects of Ixora Pavetta Andrews Leaf

LATIF NAJMI[1], SHAFAQ RAFIQ[2], SYED HYDER RAZA[3], GUL-E-NAZISH[4]
[1]*Assistant Professor, Department of Medicine, Amna Inayat Medical College, Lahore*
[2]*Family Physician, Mirpur, Azad Kashmir*
[3]*Professor, Department of Pharmacology, Niazi Medical and Dental College, Sargodha*
[4]*Assistant Professor, Department of Pharmacology, Amna Inayat Medical College, Lahore*
Corresponding author: Latif Najmi, Email: Apdrlatifnajmifcps@gmail.com, Cell: +92 321 4767 931

ABSTRACT

Background: The aim of this study was to evaluate the effect of ethanol extract of I.pavetta Andrews leaf on acute toxicity, anti-inflammation, antipyretic and analgesic effect in albino rats.

Methodology: The plant leaves I.pavetta were taken and obtained materials were washed, shade dried into coarse powder using a mechanical grinder and then to prepare ethanol extract. The different phytochemical compounds such as alkaloids, saponins, glycosides and tannins were present in the ethanol extracts. The total number of rats was 30 which included male and female albino rats. The age range was 160-240g. All data was analyzed by SPSS 21.

Results: The results indicated that the extract's LD50 is greater than 3000 mg/kg, p.o., and that no mortality was seen at this dose for 14 days. In terms of analgesic activity, the use of different doses of ethanol extract (600, 800mg/kg) show significantly reduced; p<0.0001*** the number of writhes and caused the highest analgesic effect than compared to the reference drug group (Aspirin 100mg/kg). The carrageenan induced hind-paw oedema in rats were used to explore the anti-inflammatory effects, and the study's findings showed that the use of different dose of extract at (600 and 800 mg/kg) had shown significantly; p<0.001** reduced inflammatory and pain effects in rats as compared to reference drug (phenylbutazone 100mg/kg). The yeast-induced pyrexia in rats was used to test the antipyretic efficacy, and the different dose of extract significantly; p<0.001** decreased body temperature at doses of (600 and 800 mg/kg) than compared to the acetylsalicylic acid (100mg/kg).

Conclusions: The ethanol extract of plant leaf I. pavetta have shown greater analgesic efficacy, anti-inflammation and antipyretic activities.

Keywords: Acetic acid, analgesic effect, anti-inflammation.

INTRODUCTION

Plants have been utilized as medicine, food, and fuel since prehistoric times. Plants produce a number of chemical compounds that improve their medicinal capabilities and can be employed directly or indirectly. Alkaloids, flavonoids, tannins, lignins, terpenoids, saponins, phytosterols, and glycosides are some of the most commonly isolated phytochemicals from the plants. [1] In traditional medicine, this plant species has been used to treat diabetes, ulcer, inflammations, fever, hepatitis and renal infection.[2, 3] There are different variety of medicinal plants that provide therapeutic benefit. Unlike to anesthetics, which permanently block the nervous system, analgesic medications affect the peripheral and central nervous systems in separate ways.[4, 5] Ixora pavetta is an evergreen tree that grows to a height of 10 meters, with bark that is 5-6 mm thick and is dark brown with a pink blaze and woody branchlets. The parts of the plants are used to treat whooping cough, anemia, UIT infection, wounds, lungs infection, and hepatic dieases.[6, 7] Because this plant is widely used in rural communities to treat a variety of diseases and analyzed the acute and sub-acute toxicity of ethanol extract from plant leaf in vivo model. Changes in certain biochemical and hematological parameters were also measured. [8, 9] They work by preventing the production of prostaglandin and the derivatives of it, which are responsible for disorders like inflammation, pain, and temperature rise. Salicylic acid has mostly been utilized recently as an intermediary in the manufacturing of agrochemicals, dyes, and colorants. Salicylate toxicity and poisoning are uncommon at prescribed levels, but they are a serious issue in underdeveloped nations where the drug is utilized as an antipyretic to treat infectious malaria in both children and the elderly.[10] The analgesic, antipyretic, and anti-inflammatory medicinal plants are also being developed and available that compete with other synthetic drugs. These phytochemical compounds are assessed for potential, effectiveness, and cytotoxicity in order to develop a compound with lower toxicity and fewer side effects.

METHODOLOGY

Fresh plant material leaves I.pavetta were taken from young plants at different region of Pakistan. The obtained materials were washed, dried and mechanically ground into the powder and defatted with petroleum ether (600-800C) in a soxhlet extractor before being air-dried and extracted with ethanol (90%). Excess solvents were removed using a rotary evaporator, and the obtained dark greenish precipitate. The ethanol extract of the plant material was screened for various classes of natural compounds by Harborne method. We were taken adult rats including male and female were age range between (160-240g) and maintained in the animal house at the department of the pharmacy institute. The rats were divided into positive control, negative control and treatment group which include different doses of ethanolic plant extract 200, 600, and 800 mg/kg. Experiments were carried out according to the guidelines for the care and use of experimental animals. For the duration of the study, observations were made and records were kept on a continuous basis first 5 hours for any behavioral changes. They were then monitored for 14 days following medication administration to determine if there was any mortality. To evaluate the ethanolic plant effect on inflammation, pyretic, analgesic and toxic effect on treated groups of rats. All data was analyzed by SPSS 21 version. Quantitative data like age was presented in form of mean±S.D. Qualitative data like gender was presented in form of frequency %. A p-value of < 0.05 was considered as statistically significant.

RESULTS

The oral administration of ethanol extract of I. pavetta leaf show antipyretic, analgesic, ant-inflammation and reduced oedema formation. These extracted plant consists of different phytochemical compounds.

Table 1: Preliminary phytochemical test analysis of ethanol extract of Ixora pavetta leaf.

Sr No.	Phytochemical tests	Alcoholic extract
1	Flavonoids	+
2	Saponins	-
3	Triterpenoids	+
4	Steroids	+
5	Alkaloids	+
6	Tannins	+
7	Glycosides	+

Mean±SEM: ANOVA SPSS 21 Test *p<0.01; **<0.001; ***p<0.0001

According to our interpretation to analyses the phytochemical screening test of ethanol extract of I.pavetta leaf that consists of different compounds were given in Table 1.

Table 2: Effect of acute toxicity of ethanol leaf extract on body weight of rats in 14 days treatment

Group	Treatment	Dose	Body weight		P=value
			0 Day	14th Day	
1	Control	3ml/kg DMSO	155.14±2.2	154.41±1.1	0.33
11	Ethanol Extract I. pavetta	200ml/kg	156.3.2±1.7	157.14±2.4	0.23
111	Ethanol Extract I. pavetta	600ml/kg	158.23±2.9	159.3.3±5.4	0.65
1V	Ethanol Extract I. pavetta	800ml/kg	157.61±9.1	157.61±2.3	0.51

Mean±SEM: ANOVA SPSS 21 Test *p<0.01; **<0.001; ***p<0.0001

Table 3: Evaluate of analgesic activity

Group	Dose mg/kg	Writhing response (No/20)	Tail immersion reaction time (sec)	Hot plat reaction time (sec)	P=value
Positive control group	3ml DMSO	55.6±2.45	3.1±1.6	8.9±1.9	0.118
Negative control group	10ml/kg acetic acid injection	101.25±36.8	51.12±0.6	67.23±2.9	0.001**
Treatment group of Ethanolic extract of I. pavetta Leaf					
1	200mg/kg	82.11±5.6	47.2±0.7	60.1±1.9	0.212
11	600mg/kg	36.8±3.1	4.5±2.5	9.3±3.5	0.0001***
111	800mg/kg	24.5±6.2	5.9±2.2	7.5±0.2	0.0001***
Reference Drug					
Aspirin	100	95.1±2.4	90.1±1.1	89.3±2.0	0.008

Mean±SEM: ANOVA SPSS 21 Test *p<0.01; **<0.001; ***p<0.0001

Table 4: Evaluate of anti-pyretic activities

Group	Dose mg/kg	Before drug	After drug			P=value
		Zero (h)	1 (h)	3 (h)	5 (h)	
Positive control group	0.3ml DMSO	37.1±2.1	37.4±2.2	37.3±1.1	37.9±3.3	0.111
Negative control group	10ml/kg yeast injection	36.12±11	38.7±5.5	40.11±2.9	45.5±4.4	0.002**
Treatment group of Ethanolic extract of I. pavetta Leaf						
1	200mg/kg	37.4±4.4	39.2 ±1.1	40.6±5.9	39.7±3.5	0.005**
11	600mg/kg	37.1±0.1	37.4±0.3	37.3±0.5	37.8±0.7	0.001**
111	800mg/kg	37.2±0.2	36.1±1.0	37.8±1.4	37.9±0.2	0.001**
Reference Drug						
Acetylsalicyclic acid (ASA)	100	37.2±0.12	37.9±1.4	37.2±1.3	37.4±0.7	0.002**

Mean±SEM: ANOVA SPSS 21 Test *p<0.01; **<0.001; ***p<0.0001

Table 5: Evaluate of anti-inflammatory activities

Group	Dose mg/kg	Oedema formation	Time (hour)			P=value
			zero (h)	2 (h)	4 (h)	
Positive control group	0.3ml DMSO	0.86±1.9	0.85±0.2	0.83±2.1	0.86±1.1	0.111
Negative control group	10mg/kg carageenan	145.1±9.1	150.2±0.5	155.3±9.1	159±1.4	0.001**
Treatment group of Ethanolic extract of I. pavetta Leaf						
1	200mg/kg	101.2±8.9	112.8±5.1	105.6±4.6	97±5.8	0.001**
11	600mg/kg	95.1±1.9	92.8±0.6	89±0.8	88.4±1.1	0.001**
111	800mg/kg	0.86±2.2	0.86.5±1.8	0.84.4±0.9	0.86.7±1.1	0.001**
Reference Drug						
Phenylbutazone	100	122.7±0.6	135.1±0.2	120.1±0.3	102.7±0.3	0.004

Mean±SEM: ANOVA SPSS 21 Test *p<0.01; **<0.001; ***p<0.0001

According to our interpretation, the acute toxicity had not shown significant (p>0.005) changes in the ethanolic leaf extract groups at different doses given 200, 600 and 800mg/kg of body weight of rats as compared to control group. It did not show any negative effect on the body weight. It proves that these extract had not toxic were shown in Table 2.

According to our interpretation, in the negative control group, the writhing was induced by the induction of 10ml/kg of 0.6% acetic acid through the rout of i.p in the rats. The number of writhing was noted by 20 min. The treatment group (Ethanolic leaf extracted) at different doses (200, 600 and 800mg/kg) which administrated orally and compare with the reference drug like aspirine (100mg/kg). The ethanolic extract at dose 600 and 800 mg/kg body weight show significantly reduced the pain and writhing by the induction of acetic acid; p=0.0001***, p=0.0001*** as compared to aspirin group but at dose 200mg/kg did not show recovery. The plant extract had potency which cause analgesic effect against thermal stimuli in hot plate model and tail immersion technique.

In our results to indicate that the ethanolic plant extract had exhibited the antipyretic activity by the induction of yeast injection in the rats to significantly increase temperature; p=0.002**. But the ethanolic extract was significantly reduced temperature at different doses; p=0.001**, p=0.001**like reference drug (ASA) were seen in Table 4.

In our results to show that, the alcoholic extract of plant leaf having anti-inflammatory effect by the induction of carageenan induced oedema in the rats' hind paw. The treated ethanolic group shown more significantly decrease the oedema in the rats at different doses; p<0.001** as compared to reference drug; p=0.004 were seen in Table 5.

DISCUSSION

A plant can be used as a biosynthetic laboratory which consists of different chemical compounds include carbohydrates, proteins, and lipids which are used as food by humans. [11] In our study to found that, the plant ingredients analyzed through a phytochemical

screening process of I. pavetta leaf ethanol extracts revealed the presence of flavonoids, tannins, gums, mucilage, carbs, and proteins, respectively. The plant is used medicinally for its anti-inflammatory, antibacterial, hepatoprotective, chemo protective and ant nociceptive properties. We had agreed with the previous study. [12, 13] In our study to found that, when comparing treated groups to the control group, it was discovered that body weight had not changed, proving that plant extracts were not toxic to the vital organs. During the trial, there was no mortality or changes in behavior, breathing, sensory responses, and cutaneous impacts. According to acute oral toxicity, 3000 mg/kg body weight was well tolerated by the animals and caused no behavioral changes and taken the different dose of extracted plant was (200, 600 and 800 mg/kg) administrated by orally. This dose did not show adverse effect on rats' body. We had agreed with the previous study. [14, 15] In our study to analyze that, the analgesic effects were examined in thermal models of utilizing acetic acid induced writhing. The different dose of extracted plant 600 and 800 mg/kg show significant; p=0.0001*** and 0.0001*** analgesic effect in the rats by acetic acid-induced writhing. The acetic acid tends to work indirectly by stimulating pain and helping to promote the release of endogenous mediators in the peripheral nervous system. Correspondingly, in both the hot plate model and the immersion reaction time, the ethanol extracted plant proved dose-related analgesic efficacy. We had agreed with the previous study.[16, 17, 18] The ethanol extracted leaves of I.pavetta that were examined have strong antipyretic and anti-inflammatory properties which associate both central and peripheral processes. The different dose of extracted plant inhibit the inflammation of carageenan-induced oedema in rats paw and provided considerable antipyretic efficacy that was significantly reduced; p<0.001** than that of reference drug (phenylbutazone); p=0.004. These findings suggest that endogenous chemical compounds released during pain, inflammation, and fever, such as histamine. It has been used to evaluate the impact of anti-inflammatory medicines that inhibit the prostaglandin synthesis. The current study found that an ethanol extract of I. pavetta leaf inhibited the paw edematous response by carageenan injection in rats' model.[19] The findings show that plant extract inhibits the lipoxygenase and cyclooxygenase pathways due to the presence of flavonoids. [20, 21]

CONCLUSIONS

Current finding suggest that the ethanol extract of plant leaf I. pavetta have shown greater analgesic efficacy, anti-inflammation and antipyretic activities. It may explain the folklore use of acute pain and the possibility that flavonoids are responsible for its beneficial effects. I.pavetta leaves has a wide margin of safety when injected to animal models, which are often used in preclinical therapeutically studies. The plants makes it possible to create high-quality herbal remedies that increase the safety and effectiveness of natural products.

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