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Original Research Article

EVALUATION OF ANTI INFLAMMATORY ACTIVITY OF *STERCULIA LYCHNOPHORA* FRUITS

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ABSTRACT

The extensive activity of study on herbal plant species and their medicinal principles across the entire world is used to evaluate Indian herbal medicine. Medicinal plants that have demonstrated their potential in possessing powerful bioactive compounds are employed in both traditional and modern medicine. A vast number of people suffer from rheumatoid arthritis of unknown inflammation for a variety of reasons. Thus, this study deals with evaluation of anti -inflammatory activity of *Sterculia lychnophora* fruits. The fruits of the plant was collected, extracted, subjected to qualitative & quantitative tests. Further the in vivo anti -inflammatory activity was checked in carrageen induced paw edema model. Results showed that the phytochemical tests revealed the presence of alkaloid, glycoside, tannin, flavonoid, steroid, & Phenol. The total phenol & flavonoid content was found to be 0.857 mg/100mg & 0.922 mg/100mg respectively. The paw edema was found to be 2.75±0.32 & 1.23±0.20 at the end of 4 hrs in 100 mg/kg & 200 mg/mg respectively. In case of standard drug indomethacin the paw edema volume at end of 4th hour was noted as 1.05±0.15. Thus it can be concluded that the extract has anti-inflammatory potential nearly equal to that of standard drug.

Keywords: Inflammation, Anti-inflammatory, Herbal medicine, Medicinal plants, *Sterculia lychnophora.* Carrageen induced paw edema

INTRODUCTION

Inflammation is a defensive response that causes various physiological modifications that minimise tissue damage and eliminate pathogenic insult. Many diseases, medical treatments, surgical operations, and trauma are predicted to cause pain. Pain is a complicated experience that involves affective, cognitive, and behavioural aspects that are all the product of a mental process; as such, it represents psychological circumstances. As a result, the phenomena of pain has pathophysiological and psychological components that are usually difficult to comprehend. Suffering is a term that is usually used in connection with pain. It implies the conscious persistence of pain or discomfort and refers to a wide range of severe and unpleasant subjective sensations that may be of medical or psychological origin. The International Association for the Study of Pain provides the most thorough and exhaustive definition of pain, which is "an unpleasant sensation and an emotional experience associated with a real or potential damage to tissue, or the equivalent of such damage" (Omoigui *et al*., 2007; Abramson and Weaver, 2005).

The inflammatory response is defined as the coordinated activation of signalling pathways that regulate the levels of inflammatory mediators in resident tissue cells and inflammatory cells drawn from the circulation. Many chronic diseases, including cardiovascular and intestinal diseases, diabetes, arthritis, and cancer, are caused by inflammation. Although the specific type of the initial stimulus and its location in the body influence inflammatory response processes, they all have a basic mechanism, which can be summarised as follows: a) Negative stimuli are recognised by cell surface pattern receptors; b) inflammatory pathways are triggered; c) inflammatory markers are produced; and d) inflammatory cells are attracted (Chen *et al*., 2018; Pearlman, 1999).

Anti-inflammatory medicines can interfere with the pathophysiology of inflammation, attempting to reduce tissue damage and increase patient comfort. Glucocorticoids and nonsteroidal anti-inflammatory medicines (NSAIDs) are the two major classes of anti-inflammatory medications. However, typical NSAIDs act in a non-selective manner, suppressing both forms of COX and causing adverse effects. The presence of two COX isoforms is associated with distinct anti-inflammatory effects and negative effect. As a result, it is clear that a significant number of plant-derived compounds are part of modern medicine's therapeutic arsenal. Because of the huge number of species available for investigation, the success of the creation of novel naturally occurring anti-inflammatory medications is essentially dependent on a multidisciplinary effort in the discovery of new leading molecules (Vane and Botting, 1996; Bovill, 1997).

Scaphium affine (Mast.) Pierre matured, ripened, and dried seeds, known as Pangdahai (PDH) in Chinese and recorded as *Sterculia lychnophora* Hance (scientific synonym) in the 2015 edition of the Chinese Pharmacopoea, have been widely utilised in traditional medicine. The plant has extremely polar elements such polysaccharides, which are employed in the traditional and ethno-medicinal treatment of constipation, pharyngitis, and discomfort, and their usage has been justified by pharmacological research on the polysaccharides and aqueous extracts. Furthermore, this research found that organic (ethanolic and methanolic) extracts of PDH show a variety of pharmacological actions such as anti-ulcer, anti-pyretic, anti-microbial, anti-obesity, and analgesic properties, while receiving little attention (Oppong *et al*., 2018; El-Sherei *et al*., 2016). Thus, this study deals with evaluation of anti - inflammatory activity of *Sterculia lychnophora* fruits.

MATERIALS & METHODS

Collection of plant materials

The fruits of *Sterculia lychnophora* were collected from local area of Bhopal in the month of March, 2023 considering the seasonal conditions for obtaining maximum phytoconstituents.

Defatting & extraction

The plant material was first treated with petroleum ether for 24 hrs. The defatted plant were subjected to extraction by ethanol and water (ethanol: water; 70:30) as solvent for about 24 hrs. The liquid extracts were collected in a tarred conical flask (Chiarotti,

1993). The solvent removed from the extract by evaporation method using hot plate.

Estimation of total phenolic content

The total phenolic content was estimated according to the FC method. The aliquots of the extract was taken in a test tube and made up to the volume of 1 ml with distilled water. Then 1 ml of Folin-Ciocalteu reagent (1:1 with water) and 1ml of sodium carbonate solution were added. After mixing, solution was incubated at room temperature for 10 minutes and the absorbance was recorded at 765 nm against the reagent blank. Using gallic acid, a standard curve was prepared. Using the standard curve, the total phenolic content was calculated and expressed as gallic acid equivalent in µg/mg of extract.

Estimation of total flavonoids content

Total flavonoid contents of all the extracts were determined and expressed as quercetin equivalent in µg/mg of extract. An aliquot (1ml) of extracts or standard solution of quercetin (20, 40, 60, 80 and 100mg/ml) was added with 1 ml of 2 % $AlCl_3$. The mixture was incubated for 15 min at room temperature. The total volume was made up to 10ml by adding distilled water. The solution was mixed well and the absorbance was measured at 420 nm. Using the standard curve, the total flavonoid content was calculated.

Animals

Wistar rats (150–200 g) were group housed (n= 6) under a standard 12 h light/dark cycle and controlled conditions of temperature and humidity (25±2 °C, 55–65%). Rats received standard rodent chow and water *ad libitum*. Rats were acclimatized to laboratory conditions for 7 days before carrying out the experiments.

Grouping of animals

Group I was treated as control (0.1 ml of 1% (w/v) of was treated with carragenan (1%w/v) in saline in the subplanter region of the right hind paw),

Group II Carragenan + fruits extract of *Sterculia lychnophora* -100 mg/kg.

Group III: Carragenan + fruits extract of *Sterculia lychnophora* -100 mg/kg.

Group IV: Carragenan + Indomethacin (10 mg/kg bw).

Oedema was induced by injecting 0.1 ml. of a 1% solution of carrageenan in saline into the sub plantar region of the right hind paw of the rats. The volumes of oedema of the injected and the contralateral paws were measured after the induction of inflammation using a plethysomgraph (Ambedkar *et al.,* 2012).

Statistical Analysis

All analysis was performed using graph pad prism for Windows. All statistical analysis is expressed as mean ± standard error of the mean (SEM). Data were analyzed by one-way ANOVA, where applicable $p<0.05$ was considered statistically significant, compared with vehicle followed by Dunnett's test.

RESULTS AND DISCUSSION

The phytochemical tests revealed the presence of alkaloid, glycoside, tannin, flavonoid, steroid, & Phenol. The total phenol & flavonoid content was found to be 0.857 mg/100mg & 0.922 mg/100mg respectively.

Further, the paw edema measurements were taken at different time points after administering the treatments, such as 0 minutes, 30 minutes, 1 hour, 2 hours, and 4 hours, and the values were recorded using techniques such as plethysmometry. The paw edema was found to be 2.75±0.32 & 1.23±0.20 at the end of 4 hrs in 100 mg/kg & 200 mg/mg respectively. In case of standard drug indomethacin the pa edema volume at end of 4th hour was noted as 1.05±0.15. In the group of animals which are neither treated with plant extract nor with standard drug the paw edema volume got increased upto 5.15±0.14

The first phase (1 h after carrageenan challenge) involves the release of serotonin and histamine from mast cells, the second phase (3 h) is provided by kinins, and the third phase (5 h) is mediated by prostaglandins, cyclooxygenase products, and lipoxygenase products. The existence of alkaloids 12 could explain the current activity. Alkaloids may decrease antigen and mitogen-induced lymphocyte proliferation, natural killer cell cytotoxicity, histamine release by mast cells, and interleukin 1 production by human monocytes.

Table 1: Estimation of total phenolic and flavonoids content of *Sterculia lychnophora*

S. No.	Hydroalcoholic extract	Total phenol content	Total flavonoids content
1.	*Sterculia lychnophora*	0.857 mg/100mg	0.922 mg/100mg

Table 2: Effect of extract of *Sterculia lychnophora* on paw edema induced by carrageenan in rats by different timelines

Groups	Dose (mg/kg)	0 hr	30 min	1 hr	2 hr	4 hr
Group-I	0.1 ml of 1% (w/v)	3.85±0.15	4.35±0.32	4.35±0.32	4.85±0.12	5.15±0.14
Group-II	100 mg/kg	2.60±0.20	2.65±0.14	2.65±0.14	2.85±0.15	2.75±0.32
Group-III	200 mg/mg	1.85±0.18	1.75±0.36	1.55±0.25	1.45±0.32	1.23±0.20
Group-IV	10 mg/kg	1.46±0.17	0.95±0.22	0.78±0.36	0.65±0.22	1.05±0.15

Values are expressed as mean ± SD.

*P < 0.05-significant compared to carragenan treated group.

CONCLUSION

The current study shows that the herbal hydroalcoholic extract of *Sterculia lychnophora* has a potent anti-nociceptive effect against carrageenan-induced oedema and may work by inhibiting inflammatory mediators such as prostaglandins and bradykinin. The current study reveals that *Sterculia lychnophora* has powerful anti-inflammatory effect, but further research into the active principle responsible for the pharmacological activity is required to obtain a complete profile of the medicine. These powerful chemicals can be used to create a new potent anti-inflammatory formulation that is beneficial in acute inflammatory illnesses.

DECLARATION OF INTEREST

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of this article.

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