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ANALGESIC AND ANTI-INFLAMMATORY EFFECT OF METHANOLIC EXTRACT OF *PHYSALIS ANGULATA* ROOTS IN RATS

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ABSTRACT

Methanolic extract of *Physalis angulata* roots were evaluated for analgesic and anti-inflammatory effects on Wistar rat model. Analgesic and anti-inflammatory potential of *Physalis angulata* roots at doses of 100, 200 mg/kg was evaluated against the standard drug indomethacin at a dose of 20 mg/kg, p.o. Wistar rats of either sex of six numbers in each group was undertaken for study and evaluated by acetic acid-induced writhing, hot plate reaction time, carrageenan-induced hind paw edema and safety test on gastric mucosa method. Methanolic extract of *Physalis angulata* showed anti-nociceptive effect in acetic acid-induced writhing characterized by a significant decrease in the number of writhings in rats ($p < 0.01$). In hot plate test, *Physalis angulata* showed nociceptive reaction towards thermal stimuli in rats and a significant increase in the reaction time was observed ($p < 0.01$). The test drug significantly inhibited the carrageenan-induced hind paw edema in rats that is indicative of the anti-inflammatory effect of *Physalis angulata* ($p < 0.01$). However, no gastric lesions were observed in *Physalis angulata* treated rats indicating the safety of test drug. The methanolic extract of *Physalis angulata* showed significant analgesic and anti-inflammatory effects in different animal models.

Keywords: *Physalis angulata*, roots, indomethacin, carrageenan.

INTRODUCTION

Physalis angulata is a general plant in South Asia has been reported as a wealthy source of various flavonoids with various pharmacological properties[1]. Inflammation is one of the oldest known diseases of mankind affecting a large population of the world[2]. No considerable progress has been made in achieving a permanent cure of inflammation and wounds. The search of screening and development of drugs for wound healing is a serious problem[3]. There is much expectation of finding anti-inflammatory drugs from native plants, as these are still used in therapeutics despite the progress made in conventional chemistry and pharmacology for producing effective drugs[4]. The practice of plants, plant extracts or plant-derived pure chemicals to deal with disease become a therapeutic modality, which has stood the test of time. As understood by the World Health Organization (WHO), about three quarters of the world population depends upon traditional remedies (mainly herbs) for the health care of its people. The conventional medicines also some time called as, herbal or natural medicine existed in one way or another in different cultures/civilizations [5,6]. The present study was undertaken to investigate the analgesic and anti-inflammatory effects of *Physalis angulata* roots in different animal models.

MATERIALS AND METHODS

Plant material

The roots of *Physalis angulata* were collected and authenticated by Dr.P.Jayaraman Ph.D., Plant Anatomy Research Centre (PARC), Tambaram, Voucher number is (281/TN/2010).

Preparation of methanolic extract of *Physalis angulata* roots

The dried *roots*(300g) was powdered and passing through a 80 mesh and than extracted with 95% ethanol using a soxhlet apparatus. The extract was filtered through cotton wool plug and dried in vacuum rotary evaporator at 40-60^{0}C under vacuum and complete dryness.

Preliminary phytochemical screening

Chloroform, methanolic and aqueous extracts of *Physalis angulata* was subjected to preliminary phytochemical screening for their presence or absence of active constituents utilizing standard method of analyses[7].

Experimental animals

Wistar rats (100–150 g; 4–6 weeks old, either sex) were maintained under controlled

conditions of light (12h/12h), temperature (26±2°C) and relative humidity (44–56%) for one week before and during the experiments. The animals had access to standard laboratory feed water *ad libitum*.

ANALGESIC ACTIVITY

Acetic acid-induced writhing test

Analgesic activity was assessed by abdominal writhing test using acetic acid. The animals were divided into four groups (n=6 each). Group I- acetic acid control (normal saline, 5ml/kg, p.o.); group II- indomethacin solution (20mg/kg,p.o.); group III- *Physalis angulata* (100 mg/kg, p.o.); group IV- *Physalis angulata* (200 mg/kg, p.o.). In the writhing test, 0.2 ml of 0.6 % acetic acid solution was injected intraperitoneally and the number of writhes were counted starting 5 min after injection for a period of 20 minutes.

Hot plate reaction time

Analgesic activity was assessed by hot plate latency assay[8]. The animals were divided into four groups (n=6 each). Group I: control (normal saline 5ml/kg, p.o.); group II: indomethacin (20 mg/kg p.o); group III: *Physalis angulata* (100mg/kg, p.o.); group IV: *Physalis angulata* (200mg/kg, p.o.). Rats from each group were placed on the hot plate after drug administration. Then reaction time for the animal to lick the paw or jump from the hot plate was taken as the latency (s). This was repeated at 60 and 90 minutes from the exact time given. The average of the latency was determined from the six rats in each group. The temperature of the hot plate was maintained at 55 ± 1ºC. The cut off time was kept at 20 seconds.

Anti-inflammatory activity

Carrageenan-induced hind paw edema

Inflammation was induced by administering 0.1 ml of (1%) carrageenan into sub-plantar surface of rat hind paw[9]. The animals were divided in to four groups (n=6 each). Group-I: carrageenan control (normal saline 5ml/kg, p.o.); group-II: indomethacin (20mg/kg,p.o);group III: *Physalis angulata* (100 mg/kg, p.o.); group IV: *Physalis angulata* (200mg/kg,p.o.). In this method, all drugs were given orally. One hour later all animals were injected with 0.1 ml of 1% Carrageenan solution in the sub-plantar aponeurosis of left hind paw and the paw volume was measured by using plethysmometer at 1hr, 3hr and 5hr.

Indomethacin (20mg/kg,p.o.) as standard and methanolic extract of *Physalis angulata* administered by the intragastric route 1hr before administration of carrageenan.

Statistical analysis

All the values are expressed as mean ± S.E.M. The statistical significance was determined by ANOVA followed by Dunnett's test. Values $p < 0.05$ was considered as significant.

RESULTS AND DISCUSSION

Analgesic activity

Effect of methanolic extract of *Physalis angulata* rootss on acetic acid-induced writhing in rats

A significant decrease in acetic acid-induced writhing test was observed in 20 min observation. The score for writhing was significantly decreased by methanolic extract of *Physalis angulata* roots at doses of 100, 200mg/kg on acetic acid-induced writhing in rats over the score of control group ($p< 0.05$). The effect of methanolic extract of *Physalis angulata* roots on acetic acid-induced writhing test was comparable to indomethacin.

Table1. Effects of ethanolic extract of *Physalis angulata* roots on acetic acid-induced writhing in rats

Group	Treatment	Number of writhings in 20min
1	Acetic acid control (5 ml/kg)	14.2±0.52
2	Indomethacin (20 mg/kg)	6.24±0.21**
3	*Physalis angulata*(100mg/kg)	9.86±0.43**
4	*Physalis angulata*(200mg/kg)	6.78±0.56**

Effect of methanolic extract of *Physalis angulata* roots on hot plate reaction time in rats

A significant raise in the reaction time on hot plate was observed at 30, 60 and 90min. In comparison to control group, methanolic extract of *Physalis angulata* at doses of 100, 200mg/kg showed a significant increase in the reaction time at 30, 60 and 90 min, respectively ($p<0.05$). The effect of methanolic extract of *Physalis angulata* roots on reaction time was comparable to the standard drug, indomethacin.

Table2. Effect of ethanolic-extract of *Physalis angulata* roots on hot plate reaction time in rats

Group	Treatment	Reaction time		
		30min	60min	90min
1	Acetic acid control (5 ml/kg)	3.2±0.15	4.3±0.23	5.7±0.54
2	Indomethacin (20 mg/kg)	10.2±0.40**	9.95±0.65**	9.68±043**
3	*Physalis angulata*(100mg/kg)	5.4±0.42*	6.2±0.34*	7.6±0.51**
4	*Physalis angulata*(200mg/kg)	4.3±0.24*	5.6±0.43*	6.4±0.15**

ANTI-INFLAMMATORY ACTIVITY

Effect of methanolic extract of *Physalis angulata* roots on carrageenan induced hind paw edema in rats

The methanolic extract of *Physalis angulata* at doses of 100, 200mg/kg showed a significant reduction in the paw volume at 1st, 3rd and 5th hr as compared to control group ($p< 0.01$). The effect of methanolic extract of *Physalis angulata* roots on paw volume (edema) was comparable to the standard drug, indomethacin.

Table3. Effect of ethanolic extract of *Physalis angulata* roots on carrageenan induced hind paw edema in rats

Group	Treatment	Increase in paw volume (ml.) after carrageenan administration			
		0hr	1st hr	3rd hr	5th hr
1	Acetic acid control (5 ml/kg)	0.91±0.13	2.0±0.23	1.97±0.34	1.79±0.04
2	Indomethacin (20 mg/kg)	0.90 ± 0.1	1.30 ± 0.03**	1.10 ± 0.03**	1.12 ± 0.03**
3	*Physalis angulata*(100mg/kg)	0.94 ± 0.02	1.50 ± 0.04**	1.75 ± 0.03**	1.40 ± 0.04**
4	*Physalis angulata*(200mg/kg)	0.91 ± 0.03	1.36 ± 0.05**	1.28 ± 0.05**	1.22 ± 0.05**

The observations of present study indicate that the methanolic extract of *Physalis angulata* possesses analgesic and anti-inflammatory effects which are comparable to that of standard[10]. Among the doses, *Physalis angulata* (200 mg/kg) higher dose was found to be more effective

than *Physalis angulata* (100mg/kg) lowest dose. The abdominal constriction response produced by acetic acid is a sensitive method to establish peripherally acting analgesics. The response is thought to involve local peritoneal receptors. The mean score for writhing was decreased significantly by treatment with methanolic extract of *Physalis angulata*. In hot plate test, nociceptive reaction against thermal stimuli in rats is a well-established model for detection of opiate analgesic as well as several types of analgesic drugs from spinal origin[11]. A significant raise in the reaction time at various dose levels of methanolic extract of *Physalis angulata* roots (100, 200mg/kg) was observed at 30 min, 60 min and 90 min increased the reaction time in a dose dependent manner which is comparable to indomethacin. These findings suggest that the *Physalis angulata* exerts analgesic effect similar to non-steroidal anti-inflammatory drugs. Thus the anti-nociceptive activity shown by *Physalis angulata* in methanolic extract on hot plate and acetic acid-induced writhing test might possess centrally and peripherally mediated anti-nociceptive properties. Prostaglandins generated through cox-1 enzyme pathway have got a gastroprotective role and inhibition of cyclo-oxygenase results in the depletion of both the cox-1 and cox-2 enzymes. Considering this, the drug was investigated for the gastric irritation potential also. The results of the study exposed that no gastric irritation sign was observed with *Physalis angulata* administration. Thus, the test drug *Physalis angulata* roots may be considered safer for use as compared to indomethacin, which although having well anti-inflammatory and analgesic activity[12]. The capability of the methanolic extract of roots *Physalis angulata* to suppress abdominal writhes, increase pain threshold latency, inhibition of the phases of carrageenan-induced inflammation confirms the analgesic and anti-inflammatory properties. These findings justify conventional use of this plant in the treatment of pain and other inflammatory conditions and validate its claim of being used for the said purpose in folklore medicine.

CONCLUSION

The methanolic extract of *Physalis angulata* roots shwed that it possess analgesic and anti-inflammatory properties, which are possibly mediated by prostaglandin synthesis as well as central inhibitory mechanisms which may be of potential benefit for the management of pain and inflammatory disorders.

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