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Studies on the anti-inflammatory properties of *Drymaria cordata* leaf extract

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ABSTRACT

The anti-inflammatory effects of *Drymaria cordata* methanolic extract (DCME) at the doses 300 to 900 mg/kg body wt. p.o was evaluated and compared with control and standard drug - Indomethacin (10 mg/kg body wt. p.o.). Carrageenan-induced paw oedema model in rats and mice, formalin-induced paw licking in mice were used for evaluation. Anti-inflammatory effect of DCME was dose dependent and comparable with the standard drug- Indomethacin in carrageenan induced paw oedema in rat and mice. In formalin-induced paw licking model, there was significant reduction in duration of paw licking in early and late phase as well. Therefore, it can be concluded that DCME possesses anti-inflammatory property which could be due to presence of flavanoids, alkaloids and steroids.

Key words: Anti-inflammatory, Carrageenan, *Drymaria cordata*, Formalin, Methanolic

Histamine, serotonin, arachidonic acid metabolites and quinines play role in generation of inflammatory reactions (Portanova *et al.* 1996). *Drymaria cordata*, is a sprawling herb and its medicinal uses are antidote, appetizer, depurative, emollient, febrifuge, laxative and stimulant. The pounded leaves are applied on snake bites in China (Saklani *et al.* 1994). Studies on *Drymaria cordata* exhibited significant anti-tissive (Mukherjee *et al.* 1997) as well as antibacterial and anti-inflammatory activity (Mukherjee *et al.* 1997, Mukherjee *et al.* 1998). In the present study the anti-inflammatory effects of *Drymaria cordata* methanolic extract (DCME) was evaluated.

MATERIALS AND METHODS

The leaves of *Drymaria cordata* L. (AAU/CVSC/PHT/07-08), used for the study were collected (July–September 2007) from the Institute's medicinal garden processed and methanolic extract was prepared as per standard procedure. Adult male Wistar rats (150–220 g) and male albino mice (20–22 g) were randomly divided into 5 groups comprising 6 animals each and kept under normal condition. The animals were divided as: group 1- NSS (control); group 2 to 4 (300 to 900 mg/kg body wt p.o); group 5- Standard drug–Indomethacin (10 mg/kg body wt. p.o). The anti-inflammatory activity was studied by the standard methods, viz. carrageenan induced paw oedema in rats (Winter and Porter 1962), carrageenan induced paw oedema in mice (Srimal and Dhawan 1971) and formalin induced paw licking in rat (Hunskaar and Hole 1997). Statistical analysis was done by one-way analysis of variance by using the SPSS software (version 11.5 at $P<0.05$).

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RESULTS AND DISCUSSION

The results of phytochemical studies and LD_{50} are presented in Table 1. Carrageenaan induced paw oedema which is characterized by biphasic events, in the first phase (during the first 2 h after carrageennan injection), chemical mediators like histamine and serotonin play role, while in the second phase (3–4 h after carrageenan injection), kinin and prostaglandins are involved (Hernanadez and Rabanal 2002). In our study, DCME showed a significant ($P<0.05$) reduction in the volume of paw oedema in rats starting from the 1 to 5 h (18.50 to 78.94% inhibition), @ 900 mg/kg p.o., was observed which is probably due to inhibition of different phases and chemical mediators of inflammation. The standard drug- Indomethacin showed 94.74% reduction of paw oedema volume at 5 h (Table 2). In carageenaan induced paw oedema in mice model (Table 3), the weight of the paw was significantly ($P<0.05$) and dose dependently decreased from 300 to 900 mg/kg (39.99 to 60% inhibition) respectively and was comparable to standard drug- Indomethacin (65.05%). In formalin induced paw licking test, the early phase is caused by C-fibre activaton due to the peripheral stimulus and the late phase (starting approximately 20 min after formalin injection) appears to depend on the combination of an inflammatory reaction, viz. activation of

Table 1. Physical characteristics, phytoconstituents and acute toxicity studies of DCME

Physical characteristics		Phytochemical screening (Harborne1991)			Acute toxicity studies (Horn *et al.* 1956)
		Active principle	Test applied	Results	
Colour	Dark brown	Triterpenes	Salkowski's test	+ve	>5 g/kg body weight p.o. in rats.
			Libermann Buchardt's test	+ve	
Consistency	Viscous	Alkaloids	Mayer's test	+ve	
			Wagner's test	+ve	
			Hager's test	+ve	
Recovery	8.7%		Dragendorff's test	+ve	
		Tannins	$FeCl_3$ test	+ve	
			Gelatin test	+ve	
		Flavonoids	$FeCl_3$ test	+ve	
			Lead Acetate test	+ve	
		Diterpenes	-	+ve	
		Steroids	Salkowski's test	+ve	

Table 2. Effect of DCME on carrageenan-induced hind paw oedema in rats.

Groups	Dose (mg/kg) p.o.	Inflammatory volume in ml after carrageenan injection (per cent inhibition of inflammation)					
		30 min	1 h	2 h	3 h	4 h	5 h
1	10 ml/kg	0.16±0.01	0.17±0.01	0.19±0.01	0.22±0.01	0.24±0.01	0.29±0.01
2	300	0.12±0.01 (28.8)	0.12±0.01(30.89)	0.17±0.01(14.60)	0.18±0.01(20.70)	0.19±0.01(23.40)	0.17±0.01(65.60)
3	600	0.11±0.01(31.90)	0.12±0.01(32.02)	0.13±0.01(33.68)	0.15±0.02(31.08)	0.10±0.01(57.71)	0.09±0.01(67.36)
4	900	0.13±0.01(18.40)	0.15±0.01(18.50)	0.15±0.01(23.15)	0.15±0.02(34.68)	0.11±0.02(55.55)	0.06±0.02(78.94)
5	10	0.15±0.01(07.96)	0.15±0.01(17.42)	0.13±0.01(33.16)	0.11±0.01(52.70)	0.08±0.01(67.71)	0.02±0.01(94.74)

Values are mean ± SE of 6 animals. Values in the parenthesis indicates per cent reduction $P<0.05$, $P< 0.05$ vs vehicle (one way ANOVA).

Table 3. Effect of DCME on carrageenan-induced paw oedema in mice and formalin-induced paw licking in rats.

Groups	Dose (mg/kg) p.o	Carrageenan-induced paw oedema in mice		Formalin induced paw licking in rats	
		Increase in weight of paw (mg)	% inhibition	Reaction time (s) in early phase	Reaction time (s) in late phase
1	10 ml/kg$^-$	33.33±5.58	0	65.90±3.49	124.90±17.69
2	300	20.00± 3.65	39.99	32.29±2.44	96.21±7.28
3	600	15.51± 3.65	54.51	23.46±1.70	64.47±1.67
4	900	13.33± 2.11	60.00	23.19±2.71	46.19±2.42
5	10	11.66± 1.66	65.01	20.47±1.01	32.92± 8.58

Values are mean ± SE of 6 animals.;$P<0.05$, $P<0.05$ vs vehicle (one way ANOVA).

NMDA and non-NMDA receptors and NO cascade (Davidson and Carlton 1998). In our study, DCME caused reduction of reaction time in both early and late phase in a dose-dependent manner. At 300 to 900 mg/kg in early phase, the reaction time decreased from 32.29±2.44 to 23.19±2.71sec and in late phase from 96.21±7.28 to 46.19±2.42 sec. Whereas, Indomethacin showed a reaction time of 20.47±1.01 sec in early phase and 32.92 ±8.58 sec in late phase. In the present study the anti-inflammatory activity of DCME might be due to partial inactivation of C-fiber in early phase and NMDA and non-NMDA receptors in late phase. The phytochemical screening of DCME showed the presence of flavanoids, alkaloids and steroids which are known to be responsible for anti-inflammatory activity in other plants (Kim *et al.* 2000). However, further in-depth studies are required to understand the mechanism of its activity.

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