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Studies on the Anti-inflammatory Effects of *Drymaria cordata* Willd

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Abstract – In folklore medicine *Drymaria cordata* Willd (Family-Caryophyllaceae) is reported to have laxative and anti-febrile properties along with anti-inflammatory activities. Sikkimis used this plant to treat all these ailments. The anti-inflammatory effect of the methanol extract of *D. cordata* was investigated against carrageenin, histamine, serotonin, dextran and PGE_1 induced rat hind paw oedema. It exhibited significant anti-inflammatory activity against all these phlogestic agents except PGE_1 in the order of carrageenin > serotonin > histamine. All these effects were compared with standard drug phenylbutazone in both the acute and chronic experimental models in albino rats.

Key words – *Drymaria cordata*, Anti-inflammatory activity, Phenylbutazone, Phlogestic agents

Introduction

Drymaria cordata Willd is a sub erect herb mostly found in tropical America and tropical and subtropical India (Asolkar *et al.*, 1992). It is a common weed throughout the state of Meghalaya, India and the people of this region use the juice of this whole plant in burns and other skin diseases (Dutta and Banerjee 1954; Dutta, 1954).

As reported from Garo hills the Khasis (Tribal people of this region) use this plant in snake bite (Rao, 1981). Small amounts of this plant are eaten raw together with 'ash-sale', the coction of this portion has stimulating effect (Stopp, 1961). Recently it has come to our notice that Sikkimis use this plant juice to treat inflammation and wounds. Anti-inflammatory activity of *Leucas lavandulaefolia* extract and the pentacyclic triterpenoid betulinic acid isolated from the rhizomes of *Nelumbo nucifera* Gaertn. (Family-Nymphaeaceae) has been reported from this laboratory (Saha *et al.*, 1996; Mukherjee *et al.*, 1997). The antibacterial and antitussive potentials of the *Drymaria cordata* extract has been evaluated and reported (Mukherjee *et al.*, 1997; Mukherjee *et al.*, 1997). To investigate the claim about the plant of being used for the treatment of inflammation this study was undertaken to evaluate the anti-inflammatory potential present in the herb and is being reported hereunder.

Materials and Methods

Plant material – *Drymaria cordata* herbs were collected from Gangtok, Sikkim, India and identified by Botanical Survey of India, Sikkim. A voucher specimen has been kept

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in our laboratory for future references. The plants were collected and dried under shed, pulverized by a mechanical grinder and stored in a closed vessel for future use.

Preparation of the extract – The powdered material was first extracted with petroleum ether (40°~60℃) in a soxhlet extraction apparatus. The marc obtained after extraction was further extracted successively with benzene, chloroform and methanol. The methanolic extract thus obtained was distilled under reduced pressure to remove the solvent. The methanol extract (8.19% w/w with respect to dry powdered material) thus obtained was then passed through a column made of silica gel-G (Sd. Fine Chem. Ltd.) with solvent system chloroform : methanol (1 : 1); a yellow coloured fraction was obtained which showed the presence of a steroidal compound. This fraction was evaporated to dryness, a yellowish semi-solid mass was obtained (yield 3.002% w/w with respect to dry starting material) was stored and used for evaluation of anti-inflammatory activity by dissolving in normal saline in different doses.

Animals used – White Albino rats (130~150 g), (Wistar strain) were used for this experiment. The animals were purchased from M/S B.N. Ghosh & Co., Calcutta and were housed in standard metal cages and provided with food and water *ad libitum*.

Carrageenin-induced rat paw oedema – 1% Solution/suspension of carrageenin was prepared. 0.1 ml of this solution was injected into the right hind paw of male rat (Winter *et al.*, 1962). The extract (200 mg/kg and 400 mg/kg), phenylbutazone (100 mg/kg) and control vehicle were injected intraperitoneally (i. p) 30 min. prior to the injection of carrageenin. The paw volume was measured just before and 1, 2, 3, 4, 5 hr after administration of carrageenin by the volume displacement method (Bhattacharya *et al.*, 1977).

Mediator induced inflammation – The anti-inflammatory activity of the extract was measured with some phlogestic agents, which act as mediator of the inflammation to study the selectivity of the plant extract. 0.1 ml solution of histamine base (10^{-3} g/ml), serotonin (10^{-3} g/ml), dextran and prostaglandin E_1 were injected into the right hind paw and the oedema volume was determined. The extract at dose of 400 mg/kg was injected along with the mediators which served as drug treated group and the others injected only with the mediators served as control group (Parmar *et al.*, 1978). The paw volume was measured 30 min. after injection of the phlogestic agents.

In the above two cases the degree of oedema formation was assayed by measuring the hind paw volume plethysmographically. The volume displacement has been expressed as units. One unit being equivalent to 0.072 ml. The % inhibition of oedema has been calculated by $100\times(V_c-V_t)/V_c$, where V_c is average increase in paw volume of control and Vt the average increase in paw volume after drug treatment.

Chronic tests – The rats were anaesthetised and 10 mg of sterile cotton pellets were inserted one in each axilla of rats. Extract (200 and 400 mg/kg), phenylbutazone (100 mg/kg) and control vehicle were administered intraperitoneally for 7 consecutive days from the day of cotton pellet inplantation. The animals were anaesthetised again on the 8th day and cotton pellets were removed surgically, freed from extraneous tissue, incubated at 37℃ for 24 hrs and dried at 60℃ to constant weight. Increment in dry weight of the pellets was taken as a measure for granuloma formation (Winter *et al.*, 1957).

Results and Discussion

The anti-inflammatory activity of *D. cordata* against acute pedal oedema (induced by carrageenin) has been shown in Table 1, which showed significant anti-inflammatory activity and the results were comparable to that of phenylbutazone, prototype of non-ster-

Table 1. Effect of *D. cordata* extract and phenylbutazone in carrageenin induced pedal oedema in rats (N=10)

Treatment	Dose (mg/kg)	Paw volume (ml)	Percentage of inhibition	*p-value
Carrageenin control	-	0.73±0.035	-	-
D. cordata extract	200	0.48±0.039	34.24	<0.001
D. cordata extract	400	0.35±0.041	52.05	<0.001
Phenyl-butazone	100	0.30±0.040	58.90	<0.001

*p-value was calculated by comparing with control by Student's t-test

Table 2. Effect of *D. cordata* extract (400 mg/kg) on mediator induced pedal oedema in rats (N=10)

Treatment	Paw volume	% inhibition	*p-value
Histamine control	0.41±0.03	-	-
Histamine with Extract	0.30±0.04	27	<0.05
Serotonin control	0.61±0.02	-	-
Serotonin with Extract	0.31±0.04	49.2	<0.001
Dextran control	0.43±0.03	-	<0.05
Dextran with Extract	0.33±0.02	23.3	-
PGE_1-control	0.48±0.05	-	N.S.
PGE_1 with Extract	0.47±0.01	-	

*p-value was calculated by comparing with control by Student's t-test.

Table 3. Effect of *D. cordata* extract on granuloma pouch in rats (N=10)

Treatment	Dose (mg/kg)	Weight (mg)	Inhibition (%)	*p-value
Control	-	47.2±1.8	-	-
Extract	200	39.8±0.8	15.67	<0.01
Extract	400	25.3±0.5	46.39	<0.001
Phenylbutazone	100	19.8±0.2	58.05	<0.001

*p-value was calculated by comparing with control by Student's t-test.

oidal anti-inflammatory agents.

Since it is evident that carrageenin induced oedema is commonly used as an experimental animal model of acute inflammation and is believed to be biphasic, of which the first phase is mediated by release of histamine and 5HT in the early stage followed by kinin release and then through prostaglandin in the later phase (Castro *et al.*, 1968). So the effect of the extract against inflammations produced by these individual mediators were studied. The extract effectively suppressed the inflammation produced by histamine, serotonin. So, it may be suggested that it's anti-inflammatory activity is possibly backed by its anti-5HT activity which is responsible for the same. The extract also reduced the oedema produced by dextran which is known to be mediated both by histamine and serotonin (Parmar *et al.*, 1978)*. The extract of *D. cordata* has no anti-inflammatory activity against prostaglandin E_1 induced rat paw oedema (Table 2). The effect of the extract on granuloma pouch in rats is shown in Table 3. The *D. cordata* extract significantly inhibited granuloma formation in rats suggesting the efficacy of the extract on cotton pellet granuloma which can explain its activity in the proliferative phase of the inflammation process.

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