Anti-inflammatory activity of Munronia *pinnata* in Healthy Wistar Rats

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Introduction

Munronia pinnata (Wall) Theob (Meliaceae) locally called "*Binkohomba*" is a valuable medicinal herb in Sri Lanka. This plant is the major ingredient of the decoctions and powders used for the treatment of fever and upper respiratory tract inflammations as a substitute for *Swertia chirata* (Gentianaceae) which is named as *kiratha* or *kiratha thiktha* in Sanskrit (Dassanayake, 1995). Due to low propagating process and over exploitation, *M. pinnata* has a very high market price in the local drug market. With ever–increasing demand, *in vitro* propagation techniques were applied to conserve and cultivate this plant (Senerath *et al*., 2007).

Research Problem

In-vitro propagation techniques have been applied as an attempt to meet the increasing demand of this plant. The possible use of calli as a substitute for whole plants has been quarried.

Objectives of the Study

The purpose of the present study was thus to compare the anti-inflammatory activities of natural plants and the calli of this valuable medicinal plant in Wistar rats.

Theoretical Considerations and Empirical Evidence

Traditional physicians claim that *M. pinnata* has been used in folk medical practice in Sri Lanka for hundreds of years (Gunawardana, 1912, Anonymous, 1979, Jayaweera, 1982 & Dassanayake, 1995) to treat inflammatory conditions and diabetic mellitus.

Methodology

The anti – inflammatory activity of both aqueous extracts were evaluated by using the carrageenan induced paw oedema model in Wistar rats (Handunnetti *et al*., 2009) The mechanism of this activity mediated by MPaq and MPCaq were assessed by determining their effects on nitric oxide (NO) inhibitory and membrane stabilizing activities in rats.

Key Findings

Table 1: Effect of Mpaq and Mpcaq of *M. Pinnata* against Carageenan – Induced Paw Oedema

Treatment Groups (n=6)	Mean paw volume increase (V mL)				
	1h	2h	3h	4h	5h
Dose mg/kg					
DW	0.27±0.02	0.379±0.06	0.598±0.02	0.606±0.07	0.622±0.07
Indomethacin 10.0	0.117±0.04 (50.9)	0.139±0.02 (67.8)	0.139±0.02** (77.7)	0.120±0.03* (83.6)	0.115±0.02** (85.9)
MPaq g/kg					
11.76	0.145±0.04**	0.075±0.02	0.147±0.04**	0.122±0.03**	0.118±0.01**
	(53.1)	(65.8)	(77.3)	(82.7)	(85.5)
7.84	0.155±0.05*	0.142±0.02**	0.178±0.02**	0.176±0.03**	0.120±0.02**
	(50.1)	(59.5)	(71.1)	(74.2)	(77.1)
3.92	0.163±0.02*	0.198±0.03*	0.236±0.03**	0.224±0.04**	0.199±0.02**
	(39.8)	(48.1)	(60.5)	(63.1)	(68.1)
1.96	0.189±0.02**	0.224±0.01*	0.261±0.02**	0.243±0.02**	0.241±0.02**

	(30.2)	(41.1)	(56.4)	(60.0)	(61.2)
MPCaq g/kg					
11.76	0.124±0.02**	0.126±0.01	0.178±0.03**	0.152±0.02**	0.150±0.02**
	(48.1)	(55.7)	(70.7)	(72.6)	(75.9)
7.84	0.141±0.02*	0.174±0.03**	0.231±0.01**	0.218±0.01**	0.216±0.01**
	(40.8)	(49.1)	(61.3)	(60.0)	(65.3)
3.92	0.169±0.02*	0.225±0.01*	0.258± 0.02**	0.244±0.02**	0.242±0.02**
	(31.2)	(40.8)	(61.3)	(59.8)	(61.1)
1.96	0.199±0.02*	0.254±0.02	0.311±0.02**	0.275±0.03**	0.274±0.03**
	(26.4)	(33.2)	(48.0)	(54.7)	(56.1)

The anti- inflammatory activity of MPaq and MPCaq of *M. pinnata* in acute experimental rat model is presented in Table 1.

The local oedema was produced by a subcutaneous injection of carageenan. Inflammation progressively increased up to 3rd hour and then began to decrease. The selected doses of both extract (MPaq and MPCaq) of *M. pinnata* and indomethacin exhibited a statistically significant inhibition of the inflammation from 3rd hour to 5th hour. These results revealed that both extracts had a statistically significant ($P \leq 0.05$, $P \leq 0.001$) inhibition of inflammation and they were comparable to the reference drug, indomethacin (10.0 mg/kg). Both MP extracts exhibited a significant dose-dependent effect and the highest dose of MPaq (11.76 g/kg) showed the maximum inhibition of oedema (85.5%) which showed the similar pattern of activity along with the reference drug. Interestingly, the inhibitory effect by the dose 11.76 g/kg of MPCaq (75.9%) was very much close to 7.84 g/kg of MPaq (77%) at 5th hour. The same result was exhibited with the dose of 3.92 g/kg of MPaq (68%) and 7.84 g/kg of MPCaq (65.3%) at 5th hour. Both extracts of MP showed (Figure 1) a statistically significant ($p \leq 0.05$) inhibitory effect (MPaq – 41.46% and

MPCaq- 29.3%) on the infiltration of rat peritoneal cells compared to the control group.

Though the reference drug prednisolone exhibited the highest inhibition of 58.3percent (0.091±0.01), it was not significant statistically with both MP extracts (MPaq-0.119±0.02 and MPCaq- 0.115± 0.01). The results showed that both extracts of MP could alter the action of the endogenous factors that are involved in the migration of leukocytes to the site of inflammation, thereby reducing the inflammatory process. The tested doses of MP showed (Figure 2) a statistically significant ($p \leq 0.05$) inhibition of NO production in rat peritoneal cells (Mpaq - 94.4% and MPCaq - 83.3%). The highest inhibitory effect was obtained by the reference drug, prednisolone (95.6%).

Figure 1: Effect of *M. Pinnata* on the Infiltration of Rat Peritoneal Cells.

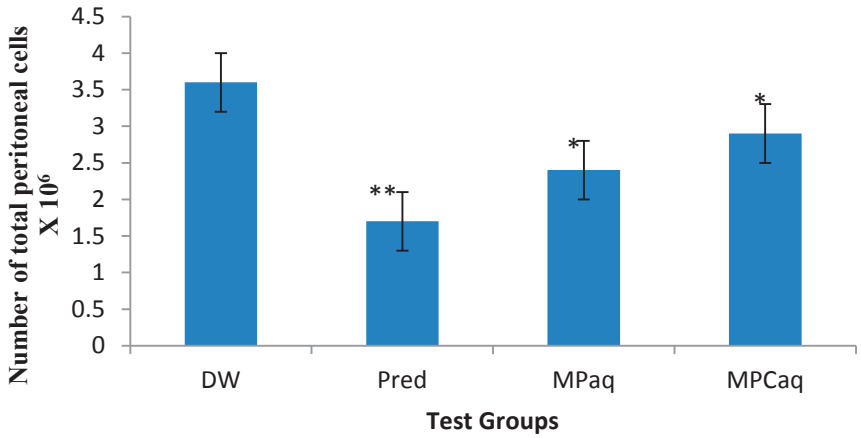
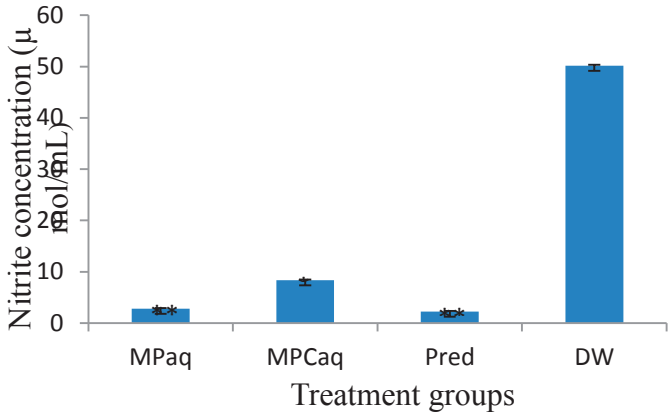


Figure 2: Effect of *M. Pinnata* on Nitric Oxide (NO) Production by Rat Peritoneal Cells



Conclusion

These results revealed the aqueous extract of *M. pinnata* exhibited significant anti - inflammatory activity in the tested models and may prove the scientific rationale for the use as anti – inflammatory agent in folk medicine. Inhibition of NO production and membrane stabilization activities are probable anti-inflammatory mechanisms as found in this activity. It was also found that the callus cultures of this plant possess similar activity and validates the conservation and cultivation of this threatened high market demand plant.

Values are expressed as mean ± SEM, Statistically significant different from each column of the control group (*P≤ 0.05, ** P≤ 0.001). Each value in parenthesis represents the percentage inhibition rate (%) following a single administration of each extract.

Each value represents the mean ± SEM from n=6 animals in each group. p≤ 0.05 compared to the control group (DW). DW- distilled water, Pred- prednisolone 10. Mg/kg, MPaq- aqueous extracts of natural plants of MP (2.0g/kg), MPCaq- aqueous extracts of calli of MP (2.0 g/kg).

Values are expressed as the mean ± SEM from n=6 animals in each group. p≤ 0.05 compared to the control group. DW- distilled water, Pred- prednisolone 10. Mg/kg, MPaq- aqueous extracts of natural plants of MP (2.0g/kg), MPCaq- aqueous extracts of calli of MP (2.0 g/kg).

Keywords: Anti – Inflammatory; Indigenous Medicine *In-Vitro* Propagation; Munronia Pinnata;

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