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Anti-inflammatory and analgesic activities of the *Sauropus androgynus*(L)Merr. (Euphorbiaceae) Plant in experimental animal models

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ABSTRACT

The present study was aimed to investigate the analgesic and anti-inflammatory effect of the aqueous and ethanolic extract of leaves of Sauropus androgynus in Wister rats. Sauropus androgynus leaf extracts (100, 200 and 400 mg/kg body weight) were evaluated for its anti-inflammatory activity by carrageenan induced rat paw edema and analgesic activity by Hot plate Test. The extracts were found to posses significant anti-inflammatory effect in ethanolic extract than when compared to aqueous extract. Significant reduction in paw edema and significant increased reaction time were observed at a dosage of 400 mg/kg/body weight.

Key words: *Sauropus androgynus*, Analgesic activity, Anti inflammatory activity.

INTRODUCTION

Sauropus androgynus Merrill of family Euphorbiaceae which is also known as *Katuk* in Indonesia. The leaves are used as antitussive, tonic and soothing lungs and to relieve internal fever. The dark-green leaves provide a rich source of chlorophyll which is a valuable blood building element, cell rejuvenator and beneficial to the circulation (1). *Sauropus androgynus* leaf was previously reported to contain considerable amounts of the alkaloid in fresh leaf (2). Inflammation is a defense mechanism, the complex events and mediators involved in the inflammatory reaction can easily be induced (3). Therefore, the development of newer and more potent anti-inflammatory drugs with lesser side effects is necessary. This study therefore seeks to examine *Sauropus androgynus* for anti-inflammatory activity and analgesic effects since pain is one of the cardinal signs of inflammation.

MATERIALS AND METHODS

Plant Material Preparation

Mature *Sauropus androgynus* leaves were obtained in local garden. The mature leaves were picked. The leaves of the plant were air dried at room temperature for 5days. The dried material was pulverized with an electric blender. The ethanolic extract was done using soxhlet apparatus. The resulting filtrate with required doses was used in this study.

Experimental Animal

Albino mice weighing between 20-25 gm were selected for the analgesic and anti-inflammatory activity was housed under the uniform laboratory condition fed with commercial diet & provided with water during the experiment. All

protocols of the study was approved by the Institutional Animal Ethical Committee with reference number 743/03/abc/CPCSEA.

Hot-plate test

The hot plate test in rats was performed by the method of (4) which was adapted for rats. The evaluated parameters were the latency time for paw licking and jumping responses on exposure to the hot plate surface, kept at 55 ± 1ºC. The animal was kept on the hot plate until it lifted one of its hind paws. Three different doses (100, 200 and 400 mg/kg) of *Sauropus androgynus* extract were administered orally to groups of five animals, 30 min before the thermal stimulus and the response was determined every 30 min, during 120 min. The data represent the mean reaction time for the animals. Latency time was recorded and the results are expressed as hot plate analgesic index (5).

Anti-inflammatory activity

The rat paw edema was induced by carrageenan (100 µg/paw), which was injected into the right hind paw plantar surface to groups of five animals each (6). Saline solution (0.9%, 0.1ml) was injected into the left paw as the control reference for the tested paw. The measurement of foot volumes was carried out following the plestimographic method described by (7). It was done by recoding the rat paw volume at 1, 2, 3, and 4 h after the carrageenan injection. The extract was administered at 100, 200 and 400 mg/kg body weight. Phenylbutazone 100 mg/kg body weight was used as standard anti-inflammatory agent.

Experimental Design

The animals were divided into 6 groups of 6 animals each and dose given as follows:
Group 1: Served as control & received distilled water at a dose 10ml/kg body weight orally.
Group 2 : Served as standard & received Papaverine at a dose of 100mg/kg body weight orally.
Group 3: Served as standard&received Phenylbutazone at a dose of 100mg/kg body weight orally.
Group 4: Served as test & received Sauropus androgynus 100 mg/kg body weight orally.
Group 5: Served as test & received Sauropus androgynus 200 mg/kg body weight orally.
Group 6: Served as test & received Sauropus androgynus 400 mg/kg body weight orally.

Table- 1: Effect of *Sauropus androgynus leaves* extracts on hot plate reaction in mice

Group	Dose (mg/kg)	Mean latency (s) before and after drug administration (s)			
		0 min.	**30 min**	**60min**	**90 min**
Group I Control	-	4.10 ± 0.03	4.60 ± 0.17	4.69 ± 0.15	5.01 ± 0.20
Group II Standard (Papaverine)	100	8.15 ± 0.05	8.45 ± 0.18**	7.20 ± 0.20**	6.35 ± 0.30**
Group III Standard (Phenylbutazone)	100	8.28 ± 0.04	8.05±0.22	7.11±0.10	6.05±0.03
Group IV Test (*Sauropus androgynus*)	100	6.10 ± 0.03	6.45 ± 0.19**	6.11 ± 0.25 **	5.73 ± 0.27**
Group V Test (*Sauropus androgynus*)	200	7.11 ± 0.03	7.35 ± 0.35	6.85 ± 0.26**	5.95 ± 0.25**
Group VI Test (*Sauropus androgynus*)	400	8.12 ± 0.03	8.35 ± 0.31**	7.85 ± 0.22**	6.95 ± 0.-15**

*Results are presented as mean ±SEM, (n=5), *p<0.01 , **p<0.05 dunnet test as compared to control*

RESULTS

The standard group at 0 min. 30min, 60 min and 90 min shows hot plate reaction time in sec of Phenylbutazone and Papaverine treated group were showed significant analgesic activity of from 30 min onwards when compared to control. Leaves extract in both the doses of 200 mg/kg and 400 mg/kg had produced significant increase in hot plate reaction time in dose depended manner from 0 to 90 min than that of 100mg/kg. The leaf extract in both doses 100mg/kg also produced significant inhibition with the mean hot plate reaction time in dose dependent manner at 0 to 90 min is shown in Table:1.

Phytochemical screening of the ethanolic extract of *Sauropus androgynus* leaves revealed the presence of anti-inflammatory effect of the extract on carrageenan induced oedema right hind paw volume in rats is shown in Table

2. There was a gradual increase in the oedema paw volume in the distilled water treated control group throughout the period of the experiment.

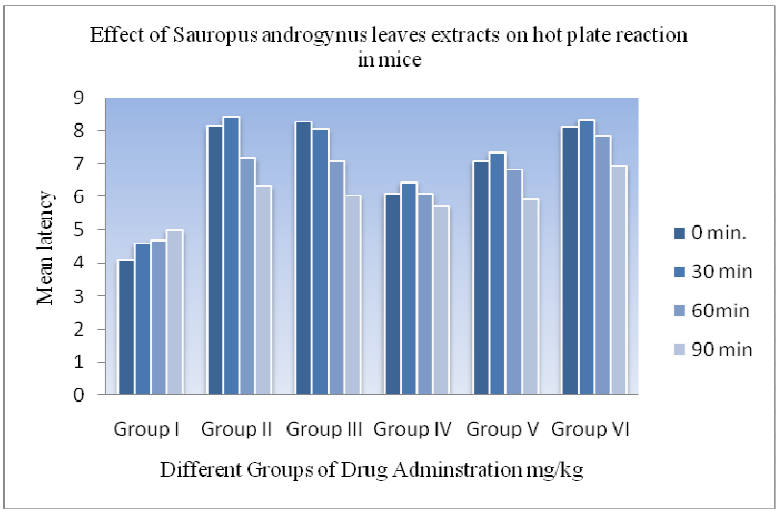
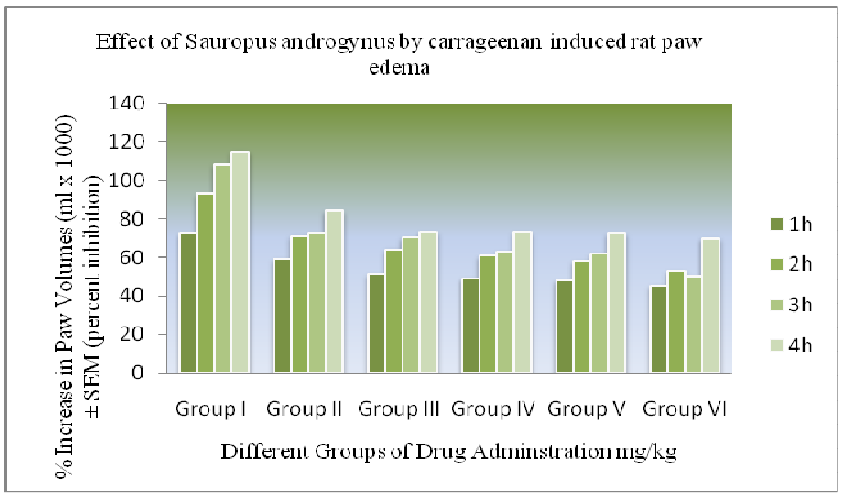


Table 2: Effect of *Sauropus androgynus* by carrageenan induced rat paw edema

Group	% Increase in Paw Volumes (ml x 1000) ± SEM (percent inhibition)			
	1h	2h	3h	4h
Group I Control	72.5 ± 2.10	93.1 ± 1.2	108.5 ± 2.31	115.2 ± 3.51
Group II Standard (Papaverine)	59.2 ± 1.15**	71.2 ± 1.95**	72.6 ± 3.56**	84.2 ± 2.6**
Group III Standard (Phenylbutazone)	51.5 ± 2.75**	64.5 ± 1.85**	70.5 ± 3.05**	73.2 ± 3.01**
Group IV Test (*Sauropus androgynus*)	49.3±1.02	60.7±1.51	63.2±1.91	73.1±2.05
Group V Test (*Sauropus androgynus*)	48.2 ± 1.52**	58.2 ± 2.75**	62.1 ± 1.6**	72.5 ± 3.06**
Group VI Test (*Sauropus androgynus*)	45.4 ± 1.02**	53.2 ± 0.25**	50.1 ± 0.6**	70.1 ± 0.05**

**p values (calculated as compared to control using one way-ANOVA followed by Dunnet's Test); **p<0.001. All values are mean of individual data obtained from six rats (n=6)*



The extract at 100, 200 and 400 mg/kg body weight as well as 100 mg/kg Papaverine and 100 mg/kg Phenylbutazone significantly reduced the oedema paw volume in a manner that was not dose dependent. There was

also substantial inhibition against the oedema induced paw volume in the extract and drug treated animals. The injection of carrageenan to the hind paw volume of the negative control increased significantly throughout the 4hrs experimental period. In contrast, the leaf extract of *Sauropus androgynus* reduced the carrageenan induced right hind paw volume in a manner that was not dose-dependent. The Papaverine and Phenylbutazone treated animals produced the highest inhibition of carrageenan induced oedema. The anti inflammatroy effect was sustained throughout the remaining period of the experiment in a manner similar to Phenylbutazone.

DISCUSSION

The results from the present study show that the leaf extract of *Sauropus androgynus* exhibited activities in various degrees against inflammation, pain and fever etc. By activating the cyclooxygenase, the levels of prostaglandin, especially PGE2, increases markedly and its production provokes inflammation, pain and fever (8). The significant reduction as well as inhibitory effect of the extract on the carrageenan-induced oedema paw volume is an indication of the anti-inflammatory potentials of the plant. Although, acetic acid extract did not inhibit both phases equally, it may still be logical to assume that it produced analgesic effect on the two phases. This may thus suggest that the extract is a centrally acting analgesic. The tail flick or tail immersion model is an index that is used to evaluate acute pains in animals (10).

The present results show that the extract of *Sauropus androgynus* leaves possesses significant elevation of body temperature in rats. The reduction induced fever by the extract in this study suggests some influence on the prostaglandin biosynthesis since it is believed to be a regulator of body temperature (11). The result of this study confirmed that *Sauropus androgynus* leaves could be beneficial in the management of inflammations, pains and fever. These activities may be due, in part, to the presence of phytochemicals such as flavonoids, alkaloids, steroids or terpenes.

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