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RESEARCH ARTICLE

Antiulcer activity of *Melastoma malabathricum* L. leaf extracts (Melastomataceae)

Balamurugan K, Nishanthini A, Mohan V.R.

Ethnopharmacology unit, Research Department of Botany, V.O.Chidambaram College, Tuticorin-628008, Tamil Nadu.

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Abstract

The objective of this study was to investigate the antiulcer activity of leaf of *Melastoma malabathricum* in rats. Antiulcer effects of the ethanol extracts at 250 and 500 mg/Kg were evaluated in rats using ethanol induced and indomethacin induced ulcer models. Phytochemical analysis was carried out using standard procedure. Results showed that the ethanol extract exhibited significant and dose dependent antiulcer activity in the models used. Percentage ulcer inhibitions of extract at 500 mg/Kg for ethanol and indomethacin induced ulcer were 64.36 % and 73.84% respectively. Ulcer protection in the model used by the extract is dose dependent and the ulcer inhibitory effects of the extract are comparable to omeperazole. Therefore, a result of present study suggests that the ethanol extract of *Melastoma malabathricum* possesses antiulcer activity.

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Introduction

Melastoma malabathricum belongs to the Melastomataceae family. It is also called the Singapore Rhododendron or Senduduk. It is an erect shrub or small tree 1.5 to 5m tall. It was traditionally used to treat diarrhoea, dysentery, leucorrhoea, hemorrhoids, wounds, and infection during confinement, toothache, flatulence, sore legs, and thrush and also it is used by the Jah hut people in Malaysia to cure diarrhea (Sunilson *et al.*, 2009). The plant possesses anticancer (Balamurugan *et al.*, 2013), hepatoprotective (Nishanthini *et al.*, 2013), Fertility enhancement (Balamurugan *et al.*, 2013) and antiinflammatory activities (Balamurugan *et al.*, 2012). Though the plants has been extensively used for various diseases including treatment of ulcers. Hence, an attempt has been made to screen the ulcer preventive and protective activity of the extract of the leaf of *Melastoma malabathricum* in animal models.

***Corresponding author: Veerabahu Ramasamy Mohan.**
Ethnopharmacology unit, Research Department of Botany, V.O.Chidambaram College, Tuticorin 628008, Tamil Nadu, India

Material and Methods**Plant materials**

The leaves of *Melastoma malabathricum* L. were collected from Daudeli, Joide Taluk, Hubli District, North Karnataka. With the help of local flora, a voucher specimens (VOCB 1637) were identified and was retained in Ethnopharmacology Unit, Research Department of Botany, V. O. Chidambaram College, Tuticorin for further reference.

Preparation of plant extract

The leaves of *Melastoma malabathricum* were dried separately under shade and then powdered with a mechanical grinder to obtain a coarse powder, which were then subjected to extraction in a Soxhlet apparatus using ethanol. The ethanol extract were concentrated in a rotatory evaporator. The concentrated ethanol extracts of leaves of *Melastoma malabathricum* were used for phytochemical screening and antiulcer activity.

Animals

Normal healthy male Wistar albino rats (180-240g) were used for the present investigation. Animals were housed under standard environmental

conditions at temperature ($25\pm 2^{\circ}\text{C}$) and light and Dark (12:12h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan Lever Ltd., Mumbai, India) and water *ad libitum*.

Acute Toxicity Studies

Acute oral toxicity study was performed as per OECD-423 guidelines (acute toxic class method), albino rats of either sex selected by random sampling were used for acute toxicity study (OECD, 1996). The animals were kept fasting for overnight and provided only with water, after which the extracts were administered orally at 5mg/kg body weight by gastric incubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administered was assigned as toxic dose. If mortality was observed in one animal then the same dose was repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50, 100 and 2000 mg/kg body weight.

Ethanol induced gastric ulcer

Experimental setup

The animals were divided into four groups of six rats each.

Group I: Rats treated with 4% W/V aqueous tween 80 (10 ml/Kg p.o) for 7 days

Group II: Rats treated with ethanol extract of leaves of *Melastoma malabathricum*, at the dose of 250 mg/Kg body weight daily for 7 days.

Group III: Rats received ethanol extract of leaves of *Melastoma malabathricum*, at the dose of 500 mg/Kg body weight daily for 7 days.

Group IV: Rats treated with Omeprazole (20 mg/Kg) body weight.

Gastric ulcers were induced in rats by administration of 8 ml/Kg 90% v/v ethanol to all groups by orally. Animals were fasted for 24hours with free access to water prior to the test. Ethanol extract of *Melastoma malabathricum*, control (4% tween 80) and the standard drug (omeprazole) were given orally 30 minutes before administration of ethanol (90% v/v; 8ml/Kg) (Mizui *et al.*, 1987).

Indomethacin induced gastric ulcer

Experimental setup

The animals were divided into four groups of six rats each. Gastric ulcers were induced in rats by administration of indomethacin (40 mg/Kg p.o) to all groups by orally. The animals were sacrificed four hour after treatment (Rainsford and Whitehouse, 1980).

Measurement of ulcer index

Immediately after the animals were sacrificed, their stomachs were dissected out, cut along the greater curvature and the mucosa were rinsed with cold normal saline to remove blood contamination, if any. The sum of the length (mm) of all lesions for each stomach was used as the ulcer index (UI) and the percentage of inhibition (%I) was calculated using the following formula (Nguelefack *et al.*, 2005)

$$\% I = (US_C - US_t) / US_C \times 100$$

Where, US_C = ulcer surface area in control

US_t = ulcer surface area in treated animals

Statistical analysis

The data were expressed as mean \pm standard error mean (S.E.M). The Significance of differences among the group was assessed using one way and multiple way analysis of variance (ANOVA). The test followed by Dunnett's test p values less than 0.05 were considered as significance.

Results

In the present study the preliminary phytochemical analysis reveals the presence of alkaloid, coumarin, glycoside, flavonoid, terpenoid, saponin, phenol, steroid and tannins. Results of acute toxicity shows the plant is safe upto a maximum doses 2000 mg/Kg. Ulcer index and percentage of protection against ulcers in the ethanol induced ulcer model and indomethacin induced ulcer model are shown in table-1. The treatment with ethanol extract of *Melastoma malabathricum* (500 mg/Kg) showed significant protection against ulcer in pretreatment (64.36% and 73.84%) respectively for ethanol and indomethacin induced ulcer when compared with the control animals. The standard drug, omeperazole showed significant ($p < 0.01$) protective effects against ulcers (76.60% and 78.74% for ethanol and indomethacin induced ulcers respectively) at a dose of 20 mg/Kg when compared with control groups when both treatment.

Ethanol (8 ml/Kg) and indomethacin (40 mg/Kg) administered respectively in the production of gastric mucosal damage. The ulcer index in control animals were 23.04 and 18.54 for ethanol and indomethacin induced ulcers respectively. Ethanol extract of *Melastoma malabathricum* (500 mg/Kg) significantly ($p < 0.01$) reduced the ulcer index as compared to control. Omeperazole, a standard antiulcer drug showed ulcer index 5.39 and 3.94 for ethanol and indomethacin ulcer (Table-1).

Table 1: Effect of methanol extract of leaf of *Melastoma malabathricum* on ethanol and Indomethacin induced gastric ulcer in rats.

Group	Ethanol (8 ml/kg)		Indomethacin (40 mg/kg)	
	Ulcer Index	Percentage Inhibition (% I)	Ulcer Index	Percentage Inhibition (% I)
Group I	23.04±1.33	-	18.54±1.29	-
Group II	13.54±1.42*	41.23	10.16±0.57**	45.19
Group III	8.21±0.96**	64.36	4.85±0.61**	73.84
Group IV	5.39±0.52**	76.60	3.94±0.16**	78.74

Data are represented as mean \pm S.E.M. Statistical analysis was done by one-way ANOVA followed by Dunnett's multiple comparison test. * $p < 0.01$ and ** $p < 0.001$ as compared to control (n = 6 in each group).

Discussion

Antiulcer activities were performed on Wistar albino rats of either sex using ethanol and indomethacin induced models. The ethanol extracts of *Melastoma malabathricum* (250 & 500 mg/Kg) showed significant antiulcer activity.

Antiulcer activity was carried out in two different models. The ethanol and indomethacin ulcers. The percentage of ulcer protection is observed in both the models but the extend of percentage protection is more in ethanol induced ulcer.

The percentage of ulcer protection variance with standard omeperazole (20 mg/Kg) and ethanol extract of *Melastoma malabathricum* (500 mg/Kg) is comparatively very less. The ulcer index is also reduced. Ulcer index parameter was used for the evaluation of antiulcer activity since ulcer formation is directly related to factors such as reduction in gastric volume, degrees in free and total activity. Ethanol extract of *Melastoma malabathricum* leaf at the dose of 500 mg/Kg and omeperazole (20 mg/Kg) had showed significant ($p < 0.01$) reduction in the ulcer index.

Ethanol induced gastric ulcer was employed to study the cytoprotective effect of the extracts. Ethanol induced gastric lesion formation may be due to stasis in gastric blood flow which contributes to the development of the hemorrhage and necrotic aspects of tissue injury. Alcohol rapidly penetrates the gastric mucosa apparently causing cell and plasma membrane permeability to sodium and water. The massive intracellular accumulation of calcium represents a major step in the pathogenesis of gastric

mucosal injury. This leads to cell death and exfoliation in the surface epithelium (Kansara and Singhal, 2013).

Indomethacin is known to induce the reactive oxygen metabolites in animal models, which may contribute to mucosal injury (Chattopadhyay *et al.*, 2006). Prostaglandin, a key molecule that stimulates the complex array of ulcer healing mechanism, gets synthesized in the mucosal cells by cyclooxygenase (COX) enzymes. It stimulates the secretion of bicarbonate and mucus, maintains mucosal blood flow and regulates mucosal turn over and repair (Hayllar and Bjarnason, 1995; Hiruma-Lima and Calvo, 2006).

The phytoconstitutions like flavonoids, tannins, terpenoids and saponin have been reported in several anti-ulcer literatures as possible gastro protective agents. Flavonoids, tannins and triterpenoids are among the cytoprotective active materials for which antiulcerogenic efficacy has been extensively confirmed (Borelli and Izzo, 2000).

Tannins may prevent ulcer development due to their protein precipitating and vaso constriction effects. Their astringent action can help precipitating micro proteins on the ulcer site, thereby forming an impervious layer the lining that hinders gut secretions and protects the underlying mucosa from toxins and other irritants (Berenguer *et al.*, 2005). The phytoconstituents found in the *Melastoma malabathricum* extract were flavonoids, tannins, terpenoids and saponin. These phytoconstituents present in the *Melastoma malabathricum* extract could be the possible agents in the prevention of ulcers in the rats.

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