Int J Pharm Bio Sci 2013 Jan; 4(1): (B) 395 - 400

Research Article **Bio chemistry**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

ANTIULCER ACTIVITY OF ETHANOLIC EXTRACT OF ROOT OF *Mukia maderaspatana (L.)* ROEMER

T.S. DHANARAJ [1*] AND M. JEGADEESAN[2]

[1]Department of Biochemistry, Enathi Rajappa college, Pattukkottai 614615, Tamilnadu.
[2]Department of Environmental & Herbal Science, Tamil University, Thanjavur, Tamilnadu

ABSTRACT

Peptic ulcer disease (PUD) is a serious gastrointestinal disorder that requires a well targeted therapeutic strategy. So many number of drugs including H2 receptor, antacid and proton pump inhibitors are available for the treatment of peptic ulcer, but clinical evaluation of all these drugs has shown incidence of relapses and side effects. This has been the rationale for the development of new antiulcer drugs and the search for novel molecules has been extended to herbal drugs that offer better protection and decreased relapse. Plant drugs are gaining popularity and are being investigated for various of disorders, including peptic ulcer. Even there are so many herbal remedies for ulcer. The present investigation reviews the antiulcer property of ethanolic extract of root of *Mukia maderaspatana* in ethanol induced ulcer models in wistar rats. The parameter determined was Gastric volume, Ulcer score, pH, Na+, K+, Free acidity, Total acidity, Pepsin, Total protein, Total carbohydrates and Carbohydrate protein ratio. Ethanolic extract of root of *M. maderaspatana* at doses of 100, 200, 300mg/kg (body weight) produced dose dependent inhibition of the gastric lesions induced by ethanol. The extract (300 mg/kg) showed significant ($P<0.01$) gastroprotectivity activity, which was compared with the standard drug Ranitidin (150 mg/kg).

KEYWORD: ***Peptic ulcer; Ethanol induced; Mukia maderaspatana***

T.S. DHANARAJ
Department of Biochemistry, Enathi Rajappa college,
Pattukkottai 614615, Tamilnadu.India

Corresponding author

INTRODUCTION

Peptic ulcer disease (PDU) encompassing gastric and duodenal ulcer is the most prevalent gastrointestinal disorder [23]. The pathophysiology of PDU involves an imbalance between offensive (acid, pepsin and H.pylori) and defensive factors (mucin, prostaglandin, bicarbonate, nitric oxide and growth factors) [11]. In India PDU is a common disease, with an estimated 15000 deaths occur each year because of PUD [23]. In the Indian Pharmaceutical industry, antacids and antiulcer drugs share 6.2 billion rupees and occupy 4.3% of the market share. Today, there are two main approaches for treating peptic ulcer. The first deals with reducing the production of gastric acid and the second with re-enforcing gastric mucosal protection [11, 23]. As many conventional allopathic medicines are there to treat various ulcer conditions, new formulations and combinations are also emerging daily by the pharmaceutical companies, but all are found to produce side effects and incidence of relapses. Nearly 240 medicinal plants and 21 plants based compound were identified as anti ulcer world wide so far [5]. In Siddha literature, many medicinal plants are indicated for anti ulcer and among them Musumusukkai (*Mukia maderaspatana (L.)* M.Roemer) is indicated for anti ulcer [18]. The aim of the present work was to investigate the antiulcer and ulcer healing properties of ethanolic extract of root of *Mukia maderaspatana.*

MATERIAL AND METHODS

Collection of plant materials

The root part of *Mukia maderaspatana (L.)* was collected from different places of Thanjavur district, Tamil nadu, south India.

Preparation of powder [10]

The root parts of *Mukia maderaspatana* were collected and dried under shade. These dried materials were mechanically powdered, sheaved using 80 meshes and stored in an airtight container. These powdered materials were used for further physiochemical, phytochemical and fluorescent analysis.

Preparation of Extracts - Successive solvent extract

100 gm of shade dried powdered plant material was extracted successively using the following solvents in a soxhlet extractor.

a) Petroleum ether (60^{o}C – 80^{o}C)
b) Benzene (80^{o}C)
c) Chloroform (60^{o}C)
d) Ethyl alcohol (78^{o}C)
e) Water (100^{o}C)

Each time before extracting with next solvent powdered was dried in an air oven below 50^{o}C. Finally, marc was macerated with chloroform water for 24 hour to obtain the aqueous extract. The extract was concentrated by distilling off the solvent and then evaporating to dryness on a water-bath. The extract was weighed and its percentage was calculated in terms of air-dried weight of the plant material. Ethyl alcohol extracts was used for biochemical and pharmacological studies.

Anti-Ulcer Activities (Ethanol-induced Model)

The gastric ulcers were induced in rats of either sex weighing 150 – 160g by administrating absolute alcohol (8ml/Kg). They were kept in specially constructed cages to prevent coprophagia during and after the experiment. The rats were divided into groups of five groups each containing six animals and fasted for 24 hours allowing free access to water. First group that received ethanol orally was served as control. The second group receives ethanol and standard antiulcer drugs Ranitidine (150 mg/Kg). The third, fourth and fifth groups were given absolute alcohol and ethanol extract of *Mukia maderaspatana* root at a dose of 100, 200 and 300 mg/kg b.w

respectively. The drugs were administered orally 30 min. prior to the oral administration of absolute ethanol. The animals were anaesthetized 6 hr later with either stomachs were incised along the greater curvature, collected the gastric juice and ulceration was scored. The Experimental protocol was subjected to the scrutiny of Institutional Animal Ethics Committee and was cleared by the same before starting. The samples were analyzed for gastric volume, pH, free and total acidity, sodium and potassium output as recommended [8, 14, 20]. Biochemical estimations like total proteins, total hexoses, hexosamine, fucose, sialic acid and pepsin [2, 3, 4, 17, 24, 25] were also done. The mucosa was flushed with saline and stomach pinned on a frog board and scored. The scoring is done as described by Laurence and Bacharach [15] in the table 1.

Table 1
Ulcer Score

Ulcer Score	Descriptive Observation
0	Normal rugal pattern
1	Alteration in normal rugal pattern
2	Scattered haemorrhage lesions
3	Haemorrhage lesions and ulcers
4	Penetrating and perforating ulcers

RESULTS & DISCUSSION

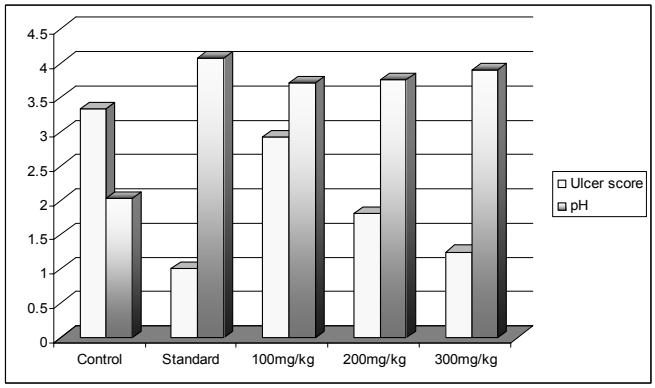
The ethanolic extract of root of *Mukia maderaspatana* exhibited concentration dependent, marked gastroprotection and neutralization in ethanol induced ulcer model at the dose of 100, 200, 300 mg/kg Physiological values like gastric volume, ulcer score, pH, sodium concentration, potassium concentration, free and total acidity are given in table 2 (Fig.1).

Table 2
Antiulcer activity of Mukia maderaspatana root – Physiological values

S.No.	Group	Gastric volume (ml)	Ulcer score	pH	Na+ mg/l	K+ mg/l	Free acidity (mg/l)	Total acidity (mg/l)
1.	Control	4.07 □ 0.14	3.34 □ 0.07	2.03 □ 0.04	2.10 □ 0.08	0.86□ 0.06	43.30 □ 1.59	75.39 □ 1.05
2.	Standard	3.09 □ 0.12**	1.00 □ 0.13**	4.08 □ 0.69***	1.75 □ 0.05***	0.71 □ 0.07***	31.80 □ 0.60***	47.66 □ 1.03***
3.	100mg/kg	3.68□ 0.415***	2.93 □ 0.09***	3.71 □ 0.14NS	1.85 □ 0.03**	0.83 □ 0.01***	35.60 □ 0.73***	60.32□ 1.13***
4.	200mg/kg	3.42□ 0.07***	1.81 □ 0.06***	3.76 □ 0.13***	1.81 □ 0.03***	0.80 □ 0.14**	31.84 □ 0.65***	58.45 □ 0.65***
5.	300mg/kg	3.13□ 0.05ns	1.25 □ 0.07***	3.90□ 0.18***	1.80 □ 0.04***	0.75 □ 0.09**	30.76 □ 1.28***	50.13 □ 1.22***

Values are expressed as mean ± SD, n = 6 compared to control;
****** p ≤ 0.001. ; ** p ≤0.01 ; * p ≤ 0.05 ; NS – Not significant***

Figure.1
Physiological parameters for Antiulcer activity of M. maderaspatana root



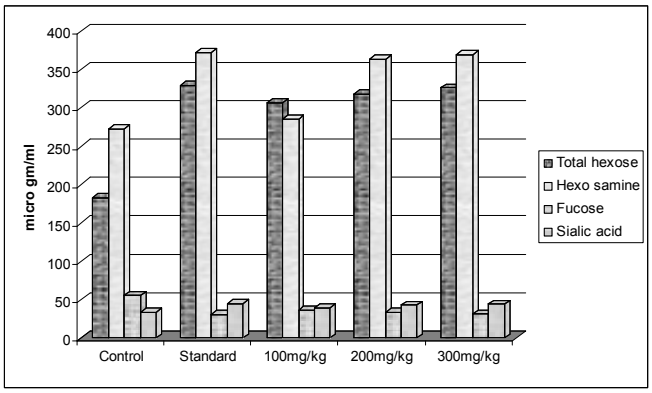
Biochemical values like total protein, total hexoses, hexosamine, fucose, sialic acid and pepsin are given in table 3 (Fig.2).

Table 3
Antiulcer activity of Mukia maderaspatana root – Biochemical values

S.No.	Group	Pepsin (□g/ml)	Total protein (□g/ml)	Total carbohydrates (□g/ml)				Carbohydrate and protein ratio
				Total hexose	Hexo samine	Fucose	Sialic acid	
1.	Control	7.07 □ 0.09	626.70 □ 14.47	182.86 □ 3.97	272.35 □ 3.80	55.64 □ 1.03	33.35 □ 0.83	0.86 □ 0.02
2.	Standard	5.05 □ 0.55***	316.53 □ 4.13***	330.04 □ 3.26***	371.80 □ 1.25***	30.37 □ 1.82***	45.04 □ 0.06***	2.45□ 0.06***
3.	100mg/kg	6.71 □ 0.97***	448.42 □ 4.02***	306.50 □ 4.49***	285.16□ 3.31NS	36.53 □ 2.27***	39.13 □ 0.48***	1.48 □ 0.05***
4.	200mg/kg	6.19 □ 0.32***	420.23 □ 3.36***	318.16 □ 1.32***	363.50 □ 2.74**	33.30 □ 2.04***	42.73 □ 0.95***	1.80 □ 0.13***
5.	300mg/kg	5.95 □ 0.13***	323.56 □ 1.48***	325.98 □ 3.83***	369.81 □ 1.55**	31.31□ 2.07***	44.04 □ 0.21***	2.38 □ 0.30***

Values are expressed as mean ± SD, n = 6 compared to control;
****** p ≤ 0.001. ; ** p ≤0.01 ; * p ≤ 0.05 ; NS – Not significant***

Figure.2
Biochemical parameters for Antiulcer activity of M. maderaspatana root



The ethanolic extract of root of *Mukia maderaspatana* exhibited concentration dependent, marked gastroprotection and neutralization in ethanol induced ulcer model at the dose of 100, 200, 300 mg/kg. The maximum gastroprotective activity was observed at a dose of 300mg/kg b.w, which was comparable with the standard drug Ranitidin. The anti-ulcer activity was also supported by the decrease in the aggressive factors like pepsin, protein and increase in the resistance factors like pH, hexose, hexosamine, any drug which increases gastric juice pH was considered as antacid [12]. Protection of experimental ulcers may be due to effect of prostaglandin in the parietal cells [16, 22]. As prostaglandin enhance the mucosal resistance, perhaps by increasing the secretion of mucous and bicarbonates [9]. Strengthen the mucosal barrier, decrease the gastric motility [21]. The mucosal defense mechanism may be due to the epithelial cell of the gastric mucosal which is impermeable to H+ there by forming a physical barrier [1]. Root extract of *Mukia maderaspatana* exhibited potent antiulcer activity by increasing hexoamine and carbohydrate protein ratio and decreasing pepsin content. The carbohydrate protein ratio is direct index of the dissolved mucosubstance in the gastric juice. The increased carbohydrate ratio suggests increased dissolved mucosubstances. The presence of dissolved mucosubstances in the gastric juice is reliable index for an effective mucosal barrier [20]. The increase in carbohydrate protein ratio is the direct reflection of mucin activity [13]. This suggests the increase in glycoprotein content of the gastric mucosa. Decreased in the protein content of gastric juice suggest the decrease of leakage of plasma protein into gastric juice [7]. Thus, the present studies justify the traditional claims suggested for root of *Mukia maderaspatana,* which have “Kunmum” character [18]. The equivalent term for Tamil word “Kunmum” is wound healing.

CONCLUSION

Modern and Indian system of medicines relay on traditional medicine. The side effect of modern medicine makes the people to return towards Ancient systems of medicine. *Mukia maderaspatana* is a traditional medicinal plant with various medicinal properties. Based on the above objective and ethanobotonical information, the present study was carried out with a view to standardize, antiulcer and ulcer healing properties of root of *Mukia maderaspatana*. Pharmacological studies on antiulcer property of the root of *Mukia maderaspatana* established their efficacy as claimed in Siddha literatures and previous ethnobotanical practices. It is suggested that *Mukia maderaspatana* could be a potential natural herbal drug for peptic ulcer disease. Further, phytochemical (isolation and structural elucidation), pharmacological and clinical studies are needed to confirm the use of *Mukia maderaspatana* as phytomedicines. The synergistic or additive pharmacological effect of biological active compounds in *M. maderaspatana* can be beneficial by eliminating the side effects encountered in the use of modern medicine. In the present work the antiulcer activity of ethanol extract of root of *Mukia maderaspatana* have been established.

REFERENCE

1. Davenport HW., Warner HA and Code CF., Functional significance of gastric mucosal barrier to sodium. J Gastroenterol., 47: 142-152, (1964)

2. Debnath PK., Gode KD., Govinda D and Sanyal AK., Effect of propranolol on gastric secretion in albino rat. British J Pharmacol, 52: 213-216, (1974)

3. Dische Z and Borentrend E., A spectrophotometer method for the micro determination of hexosamine. J Biol.Chem., 184: 517, (1950)
4. Dische Z and Schettles LB., Spetrophotometric analysis for micro determination of fucose. J Biol. Chem., 175: 595, (1948)
5. Duke JA.,Handbook of biologically active phytochemicals and their activities, Boca Raton CRC Press, Inc. (2009)
6. Duke JA., Handbook of phytochemical constituents of GRAS herbs and other economic plants, Boca Raton CRC Press, Inc. (2009)
7. Grossman MI., Control of gastric secretion, Gastro-intestinal disease, pathophysiology, diagnosis and management, W.B. Saunders Co., Philadelphia, (1978)
8. Hawk., Hawk's physiological chemistry. MacGraw Hill Book Company, New York, (1947)
9. Hogan DL., Ainsworth MA and Isenberg JI., Gastro-duodenal bicarbonate secretion, Aliment. Pharmacol. Ther., 8(5): 475-488, (1994)
10. Horborne JB., Phytochemical Methods. Chapman and Hall, Ist edn. London (1973)
11. Hoogerwerf WA., Pasricha PJ., Agents used for control of gastric acidity and treatment of peptic ulcers and gastroesophageal reflux disease, *The Pharmacological Basis of Therapeutics.* 10th ed., Mc Graw-Hill, New York, 2001, pp. 1005-19.
12. Jain SM and Santani DD., Peptic ulcer disease and status of current drug therapy. Indian Drugs, 31(9): 395-400, (1994)
13. Jain SM., Parmar NS and Santani DD., Gastric anti-ulcer activity of calcium channel blockers in rats. Indian J Pharmacol., 26: 29-34, (1994)
14. Jeffer GH., Bassett J., Mendham J and Denney RC., Vogel's textbook of quantitative chemical analysis. 5th edn. Longman Scientific & Technical, London, (1991)
15. Laurence DR and Bacharach AL., Evaluation of drug activities-Pharmacometrics, 2, Academic Press, Lodon, (1964)
16. Lauritsen K and Rask Madsen J., The mucosal resistance of prostaglandins. J Gastroenterol., 21(125): 174, (1986)
17. Lowry OH., Roseborough NI., Farr AL and Randall RJ., Protein measurement with folin phenol reagent. J Biol. Chem., 193, 265, (1951)
18. Murugesa Mudaliar KS., Gunapaadam (Siddha Materia Medica – Vegetable Section) [in Tamil], Tamil Nadu Siddha Medical Board, Chennai, India, I: 531-533, (1988)
19. Pillai NR and Santhakumari G., Effect of nimbidin on gastric acid secretion. Anc. Sci. Life, 5(2): 91-97, (1985)
20. Sanyal AK., Mitra PK and Goel, A Modified method to estimate dissolved mucos substances in gastric juice. Indian J. Exp. Biol., 21: 78-80, (1983)
21. Szabo S., Peptides, sulfhydryls and glucocorticoids in mucosal defense – coincidence or connection. J Gastroenterol., 87: 108 – 110, (1984)
22. Takeuchi N and Nobubara Y., Inhibition of gastric motor activity of 16, 16-dimethy prostaglandins E. A possible explanation of cytoprotection. Dig. Dis. Sci., 30: 1181-1188, (1985)
23. D. L.Valle. Peptic ulcer diseases and related disorders. In: Braunwald E, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL, editors. *Harrison's principles of internal medicine.* 16th ed. McGraw-Hill, New York, 2005, pp. 1746-62.
24. Warren L., The thiobarbituric acid assay of sialic acid, J. Biol. Chem., 1971-1974, (1959)
25. Winzler RJ., Determination of serum glycoprotein, Methods Biochem. Anal., 2: 279-311, (1958)