Journal of Applied Pharmaceutical Science

Available online at www.japsonline.com

Received: 08-04-2011
Revised on: 10-04-2011
Accepted: 15-04-2011

Anti-Ulcerogenic Potential of *Ficus bengalensis* Leaf, Biochemical Parameter & Histopathological Study

Mayank Kulshreshtha, Mradul Goswami, Chandana V. Rao, Vrish D Ashwlayan and Sachdev Yadav

Mayank Kulshreshtha, Mradul Goswami, Chandana V. Rao *National and Botanical Research Institute, Lucknow, India*

Vrish D Ashwlayan
Shobhit University Meerut, India

Sachdev Yadav
Banasthali University, Rajasthan-304022, India

***For Correspondence**:
Mayank Kulshreshtha*
National and Botanical Research Institute,
Lucknow, India
Email: mayankk74@gmail.com

ABSTRACT

The effect of aqueous extract of *Ficus bengalensis* (FBE) was assessed in different acute and chronic gastric ulcer models in rats. Gastric ulcers induced in swiss albino rats (200g, N=6) by oral administration of aspirin suspension and pylorus ligation. The anti ulcer activity was assessed by determining and comparing the ulcer index in the test drug groups with that of the vehicle control and standard ranitidine & sucralfate. FBE, 250–500 mg/kg administered orally, twice daily for 5 days showed dose-dependent ulcer protective effect in pylorus ligation (51.28, 63.24% protection, $P < 0.01$ to $P < 0.001$), aspirin (28.94, 64.91 protection, $P < 0.001$). The parameters taken to assess antiulcer activity were pH of gastric juice, total acidity and ulcer index. The results indicated that aqueous extract significantly ($p<0.05$) Ph, total acidity and ulcer index. On the basis of histopathology analysis, The results indicate that FBE possesses antiulcer activity in a dose dependent manner.

Key words: *Ficus bengalensis*, Pylorus ligation, Acidity, Ulcer index.

INTRODUCTION

Plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. Earliest description of curative properties of medicinal plants is found in Rig-Veda. Charaka Samhita and Sushrusha Samhita give extensive description on various medicinal herbs (Kirtikar KR, 1989). Information on medicinal plants in India has been systematically organized (Eds Ram P et al, 1989, . Eds Satyavati G et al, 1976 & Eds Satyavati et al, 1987). Medicinal plants are frequently used in gastrointestinal disturbs. Many different substances found in these plants have gastroprotective effects but few are shown to accelerate ulcer heal- ing (Zayachkivska O et al, 2005). Ficus bengalensis (English, Banyan tree; Hindi, Bargad) is a large tree with aerial roots. It grows wild in lower Himalayas and is found all over India. Different parts of the tree have been found to possess medicinal properties; leaves are good for ulcers, aerial roots are useful in gonorrhea, seeds and fruits are cooling and tonic (Parrotta John, 2001). Ficus compound showed significant antioxidant effects which may be attributed to their polyphenolic Nature (Rimi Shukla et al, 2004), the bark of Ficus bengalensis decreased fasting blood sugar (Daniel RS et al, 2003), anti-tumor activity (Mousa O et al, 1994) Anthelmintic activity (Aswar M et al, 2008), Anti-inflammatory (DJ Taur et al, 2007), Antis tress and ant allergic (Pulok K et al, 1998), Antidiarrhoeal (Mahalingam G et al, 2008), Antidiabetic and Ameliorative (Vohra, S.B et al, 1970), Anti-inflammatory (Shukla, R et al, 1994), Hypolipidemic (Joglekar, J et al, 1963), analgesic & antipyretic (Yadav, S et al, 2011), Wound healing (Babu, B, 2005). Peptic ulcer disease is a group of disorders characterized by the presence of ulcer in portion of the GI tract exposed to acid for sufficient duration and concentration (Jarald EE et al, 2006). When a peptic ulcer occurs in stomach or doudenum it is called gastric or duodenal ulcer. Duodenal ulcer occurs in first part of small intestine (duodenum). Some of the

symptoms of a duodenal ulcer like nausea vomiting, fullness of stomach, pain at late night (empty stomach) are interestingly quite opposite to those of gastric ulcers. Esophageal ulcer occurs in the lower end of esophagus. Esophageal ulcers are often associated with a bad case of acid reflux, or Gastro Esophageal Reflux Disease, as it is commonly called (GERD). Epigastric pain is the most common symptom (Beradi, R, 1997). To the best of our knowledge there were no scientific reports available in support of its traditional claims. Therefore, present study was designed to demonstrate the effect of *Ficus bengalensis* leaf extract (FBE) on physical and chemical factors induced gastric ulceration in rats.

MATERIAL AND METHOD

Collection of plant material

The leaves plant of *Ficus bengalensis* were collected from Botanical Garden Of N.B.R.I (National Botanical Research Institute), Lucknow, India in month of September 2010. The plant materials were authenticated by Dr. Sayeeda Khatoon, chemo taxonomist at National Botanical Research Institute, Lucknow and voucher specimens were deposited in the departmental herbarium of National Botanical Research Institute, Lucknow, India for future reference.

Extraction of *Ficus bengalensis*

The fresh leaves were cleaned by rinsing in clean water, rendered free of adulterants and ground. The aqueous leaf extract was obtained by macerating the ground leaves (2 kg) in distilled water (2 l) for 24 h. The resulting decoction was decanted, filtered and concentrated under pressure in a rotary evaporator (R110 Buchi, Switzerland) at 60 °C and dried to a constant weight in an oven set at 40 °C. The dried extract gave a yield of 20.14% (w/w) and was stored in an air-tight container at about 4 °C until required. The extracts obtained was further subjected pharmacological investigation.

Animals

Swiss albino rats weighing (150-240 gm) and albino mice (15-18 gm) were procured from National Botanical Research Institute (Lucknow). They were housed in the departmental animal house under standard conditions (26 ± 2°C and relative humidity 30-35%) in 12 hours light and 12 hours dark cycle respectively for 1 week before and during the experiments. Animals were provided with standard rodent pellet diet and had free excess to water. The composition of diet is 10% protein, 4% arachis oil, 1% fibers, 1% calcium, 1000 IU/gm vitamin A and 500 IU/gm vitamin D (Zimmerman M,1983).

.

Experimental Procedure

Animals were divided into six groups (n=6). Group-I Control group of animals received suspension of 1% carboxymethyl cellulose in distilled water (10ml/kg). group-II received ranitidine orally (50 mg/kg), group-III,IV received aqueous extract (250mg/kg, 500mg/kg) and in case of aspirin model sucralfate (200mg/kg) used as a standard drug.

Study of antiulcer activity using pylorus ligation method

Animals were fasted for 24 h and the dose was administrated 30 min prior to pylorus ligation. Animals were sacrificed 4 h later and the stomach was removed. The gastric content was collected and centrifuged. The volume, free acidity, total acidity of gastric fluid was determined. The stomach was then incised along the greater curvature and observed for ulcers. The number of ulcers was counted using a magnifying glass. Mean ulcer score for each animal was expressed as ulcer index. The ulcers were graded using the following scoring system- 0= Normal mucosa; 0.5= Red coloration; 1.0=Spot ulcer; 1.5=Hemorrhagic streaks; 2.0=Ulcere”3 mm but d”5 mm; 3.0=Ulcer e” 5 mm (Shay H et al, 1945).

Table-1 Effect of aqueous leaf extract of *Ficus bengalensis* on ulcer index in pylorus ligation induced ulcer:

Group	Treatment	Dose (mg/kg)	Ulcer index mm^2/rat	%Protection
I	Positive control	P.L	11.7±.96	_
II	Ranitidine	50	3.5±.46***	73.21
III	FBE	250	5.7±.65**	51.28
IV	FBE	500	4.3±.54***	63.24

Values are mean ± SEM (n=6) one way ANOVA followed by Student-Newman-keuls test. Where * represents significant at p<0.05,** represents highly significant at p< 0.01, *** represents very significant at p<0.001. when compared to control group.

Table- 2 Effect of aqueous leaf extract of *Ficus bengalensis* on pH in pylorus ligation induced ulcer

Groups	Treatments	Dose	pH of gastric content
I	Control	_	3.1±0.042
II	Ranitidine	50 mg/kg	6.0±0.042***
III	FBE	250 mg/kg	3.1±0.060
IV	FBE	500 mg/kg	3.4±0.055**

Values are mean ± SEM (n=6) one way ANOVA followed by Student-Newman-keuls test, Where * represents significant at p<0.05, ** represents highly significant at p< 0.01,*** represents very significant at p<0.001. when compared to control group.

Study of antiulcer activity using aspirin induced ulcers

The animals were treated with respective dose of 8 days as mentioned in previous model. After 8 days of treatment animals were fasted for 24 h. ulcer was induced by administration of aqueous suspension of aspirin (200 mg/kg) 4 h later. The animals were sacrificed and stomach was opened to calculate the ulcer index as given earlier (Goel R et al, 1986).

Statistical analysis

All results were expressed as mean ± SEM for 6 rats. The difference among means been analysed by unpaired student’s t-test (Newman-keuls multiple comparison test).

RESULT AND DISCUSSION

The etiology of ulcer is not clear. It results probably due to an imbalance between the aggressive and the defensive factors (Tripathi KD,2003). Gastric acid secretion is a complex, continuous process in which multiple central and peripheral factors contribute to a common endpoint: the secretion of H^+ by parietal cells. Neuronal (acetylcholine, ACh), paracrine (histamine), and endocrine (gastrin) factors all regulate acid secretion. Their specific receptors (M_3, H_2, and CCK_2 receptors, respectively) are present on the basolateral membrane of parietal cells in the body and fundus of the stomach (Hoogerwerf, 2001).

Table- 3 Effect of aqueous leaf extract of *Ficus bengalensis* on Acidity in pylorus ligation induced ulcer

Groups	Treatments	Dose	Acidity
I	Control	_	131±4.05
II	Ranitidine	50 mg/kg	28.5±1.47***
III	FBE	250 mg/kg	96.3±0.40***
IV	FBE	500 mg/kg	94.2±3.43***

Values are mean ± SEM (n=6) one way ANOVA followed by Student- Newman-keuls test, Where * represents significant at p<0.05, ** represents highly significant at p< 0.01,*** represents very significant at p<0.001. when compared to control group.

Table- 4 Effect of aqueous leaf extract of *Ficus bengalensis* on ulcer index on Aspirin induced gastric ulcers

Group	Treatment	Dose (mg/kg)	Ulcer index (mm^2/rat)	%Protection
I	Aspirin	200	11.4±0.348	_
II	Sucralfate	250	6.0±0.222***	47.36
III	FBE	250	8.1±0.312***	28.94
IV	FBE	500	4.0±0.153***	64.91

Values are mean ± SEM (n=6) one way ANOVA followed by Student- Newman-keuls test. Where * represents significant at p<0.05, ** represents highly significant at p< 0.01,*** represents very significant at p<0.001. When compared to control group.

The H_2 receptor is a G protein coupled receptor (GPCR) that activates the G_s-adenylylcyclase-cyclic AMP-PKA pathway. The H_2-receptor antagonists inhibit acid production by reversibly competing with histamine for binding to H_2 receptors on the basolateral membrane of parietal cells. Four different H_2-receptor antagonists, which differ mainly in their pharmacokinetics and propensity to cause drug interactions, are available in the United States : cimetidine (TAGAMET), ranitidine (ZANTAC), famotidine (PEPCID), and nizatidine (AXID). These drugs are less potent than proton pump inhibitors but still suppress 24-hour gastric acid secretion by about 70% (Goodman & gilman's, 2006). We evaluated effects of aqueous, chloroform and ethanol extracts obtained from *Ficus bengalensis* leaves in animals using the different standard experimental models of induced gastric ulcers. In case of Pylorus ligation model, the total acidity were decreased. Circular and linear lesions were frequently observed in the stomach of all the control animals. Administration of *Ficus bengalensis* extract resulted in a significant reduction in ulcer index in dose dependent manner with compared to control (Table 1, 2 & 3). In case of aspirin induced ulcers, extract showed significant reduction of ulcers in a dose dependent manner (Table 4).

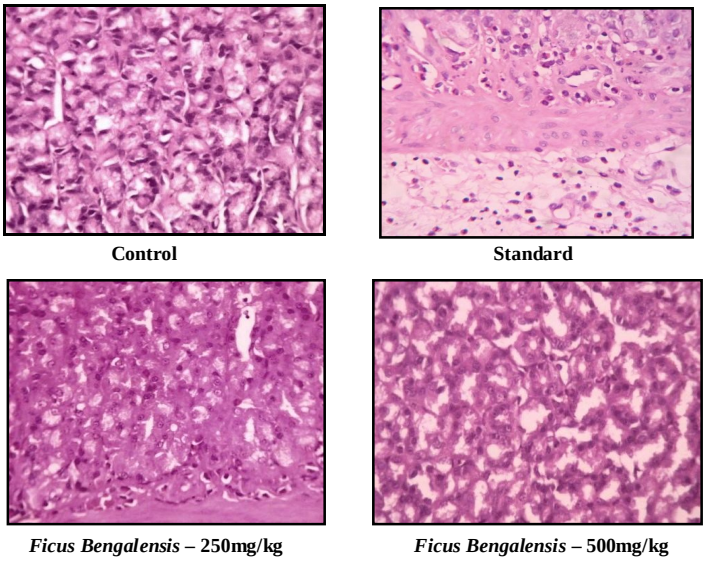

Fig: 1 FiHistopathological analysis of Pylorus ligation induced ulcer model

REFERENCES

Aswar M, Aswar U, Watkar B, Vyas M, Wagh A., Gujar KN Anthelmintic activity of *Ficus bengalensis* Int J Green Pharm, 2008,2 ,3.

Babu, B.V. Studies on Hypoglycemic action of *Ficus bengalensis* (PhD Thesis, Delhi University, Delhi); 25b. Patent applied by P.S.

Beradi, R.R., Welage, L.S. Peptic ulcer disease. In: Dipirio, J.T., Tolbert, R.L., Yee, G.C., Matzke, G.R., Wells, B.G., Posey, L.B.(Eds.), Pharmacotherapy a Pathophysiologic Approach, Seventh ed. McGraw Hill medical, New York pp (1997) 629-648.

Daniel RS, Devi KS, Augusti KT, Nair CR Mechanism of action of Antiatherogenic and related effects of *Ficus bengalensis* Linn flavonoids in experimental animals, volume 2003, 41,296- 303.

DJ Taur, SA Nirmal ,RY Patil, MD Kharya, Antis tress and ant allergic effects of *Ficusbengalensis* bark in asthma Nat Prod Res, volume 2007, 14, 1266-70.

Eds Ram P. Rastogi and B.N. Malhotra, Indian medicinal plants Central Drug Research Institute, Lucknow, Council for Scientific and Industrial Research, volume 4, New Delhi,1989.

Eds Satyavati G. V, Raina M.K. and Sharma M., Medicinal Plants of India Indian council of Medical Research, volume 4, New Delhi, 1976.

Eds Satyavati and Gupta A. K. Medicinal Plants of India Indian council of Medical Research, volume 2, New Delhi, 1987.

Goel, R.K., Gupta, S., Shankar, R., Sanyal, A.K., Antiulcerogenic effect of banana powder (Musa sapientum var paradisica) and its effect on mucosal resistance. J. Ethnopharmacol., 1986, 18, 33–44.

Goodman & gilman's, The pharmacological basis of therapeutics, 11th ed., Mcgraw-hil Publisher, United States of America 2006, 587.

Hoogerwerf, W.A., Pasricha, P.J. Agents used for control of gastric acididity and treatment of peptic ulcer and gastric esophageal reflux disease. In: Hardman, J.G., Limbird, L.E. (Eds), Goodman & Gillman the Pharmacological Basis of Therapeutics. McGraw-Hill, New York, pp (Chapter 36) 2001.

Jarald EE and Jarald ES, Medicinal Plants, CBS Publishers and Distributors , New Delhi, First edition, 2006, 135.

Joglekar, J.C., Shrotri, D.S., Aiman, R. and Balwani, J.H., A study on *Ficus bengalensis* Lin. J. Ind. Med. Assoc, 1963, 40,11-12.

Kirtikar KR and Basu BD, Indian medicinal plants, 2nd ed., volume 2, India press publisher, Allahabad, 1989, 2389.

Shay, H., Komarov, S.A., Fels, S.S., Meranze, D., Gruenstein, M., Siplet, H., A simple method for the uniform production of gastric ulceration, Gastroenterology, 1945, 5, 43–61.

Mahalingam G, Krishnan K antidiabetic and amelioferative potential of *Ficus bengalensis* bark extract in streptozotocin induced diabetic rats Indian Journal of Biochemistry, 2008, 4 ,394- 400.

Mousa O, Vuorela P, Kiviranta J, Wahab SA, Hiltohen R, Vuorela H Bioactivity of certain Egyptian*Ficus* species J Ethnopharmacol, 1994, 41,71- 6.

Parrotta John A, Healing Plants of Peninsular India, CABI publishing, USA, 2001, 517.

Pulok K. Mukherjee, Kakali Saha, T. Murugesan, S.C. Mandal, M. Pal, B.P. Saha, Screening of anti-diarrhoeal profile of some plant extracts of a specific region of West Bengal, India Journal of Ethnopharmacology, volume 60, ,1998, 85–89.

Rimi Shukla, Shweta Gupta , J.K. Gambhir , K.M. Prabhu , P.S. Murthy, Antioxidant effect of aqueous extract of the bark of *Ficus bengalensis* in hypercholesterolaemic rabbits Journal of Ethnopharmacology, volume 92, 2004, 47–5.

Shukla, R., Anand, K., Prabhu, K.M. and Murthy, P.S. Hypoglycemic effect of the water extract of *Ficus bengalensis* in alloxan recovered mildly diabetic and severely diabetic rabbits. International. J. Dia. Dev. Countries, 1994, 14, 78-81.

Tripathi KD, Essentials of medical pharmacology, 5th ed., Jaypee brothers medical publishers, New Delhi, 2003, 587.

Vohra, S.B. and Parasar, G.C. Antidiabetic studies on *Ficus bengalensis* Linn., Ind. J. Pharmacy, 1970, 32, 68-69,.

Yadav, S., Kulshreshtha, M., Goswami, M., Rao, Ch V., Sharma, V., Elucidation of analgesic and antipyretic activities of Ficus bengalensis leaves in rats, journal of applied pharmaceutical science, 2011, 1, 38-41.

Zayachkivska O.S., Konturek, S.J., Drozdowicz D., Konturek P.C., Brzozowski T., Ghegotsky M.R., Gastroprotective effects of flavonoids in plant extracts, Journal of Physiology and Pharmacology, 2005, 56, 219–231.

Zimmerman M. Ethical guidelines for investigations of experimental pain in conscious animals. Pain 1983, 16: 109-110.