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# Antiulcer Activity of Stem Bark Extract Of *Ficus Bengalensis* Linn in Rats

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## ABSTRACT

The medicinal plants have been selected for thorough studies from indigenous folk medicines, Ayurvedic, Unani and Siddha systems of medicines. *Ficus bengalensis* Linn (Moraceae) is a plant that is widely distributed in India. In traditional medicines it is used for healing obstruction of urine flow, diarrhea, dysentery, conjunctivitis, scabies and diabetes. So it has been a subject of chemical, biological and pharmacological interest since a long time. The aqueous or alcoholic extracts of various parts of this plant were found to have various pharmacological activities for example, antidiabetic, hypocholesterolemic, hypolipidemic, anti-inflammatory, anthelmintic, antibacterial, antiallergic and anti-tumor activity. The anti-ulcer activity of a methanolic extract prepared from the stem bark of *Ficus bengalensis* Linn was evaluated in rats employing the ethanol-acid and Indomethacin models to induce experimental gastric ulcers. Treatments with *Ficus bengalensis* Linn methanolic extract (100, 200 and 400mg/kg) provided significant anti-ulcer protection in the ethanol-acid and Indomethacin models.

**Keywords:** Anti-ulcer, ethanol-acid, Indomethacin, *Ficus bengalensis* Linn, dysentery

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## INTRODUCTION:

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources. Even today, plant materials continue to play a major role in primary health care in therapeutic remedies in many developing countries. Plants still continue to be almost the exclusive source of drugs for majority of the world's population. The World Health Organization reported that 80% of the world's population rely predominantly on traditional medicine and a major part of the traditional therapies involve the use of plant extracts or their active constituents[1]. *Ficus bengalensis* (Moraceae) is commonly known as Banyan tree or Vata or Vada tree in Ayurveda. There are more than 800 species and 2000 varieties of *Ficus* species, most of which are native to the old world tropics. It is endemic to Bangladesh, India and Sri Lanka[2]. *Ficus* species contain flavanoids[3], glycosides, alkaloids, carbohydrates[4], phenolic acids, steroids, saponins, coumarins, tannins, triterpinoids –oleanolic acid, rusolic acid, α- hydroxy ursolic acid, protocatechuic acid, maslinic acid. The non-enzymatic constituents include phenolic compounds, flavanoids, vitamin C. The enzymatic constituents present are ascorbate oxidase, ascorbate peroxidise, catalase, peroxidise. The phenolic compounds present are gallic acid and ellagic acid. Furanocoumarins that are reported are psoralen, bergapten[5]. The uses reported are anti-atherosclerosis, antioxidant[6], anti-diarrhoeal[7] etc. The barks were reported to have anti-diabetic activity[8]. The extracts of *Ficus bengalensis* were also reported to inhibit insulinase activity from the liver and kidney[9]. It was also found to inhibit the lipid per-oxidation[10]. Various extracts of *Ficus bengalensis* were screened for its anti-allergic and anti-stress potential in asthma by milk-induced leucocytosis and milk-induced eosinophilia[11]. Therefore, the present study was designed to demonstrate the anti-ulcerogenic effect of *Ficus bengalensis* stem bark extract on ethanol-acid and Indomethacin models.

## MATERIALS AND METHODS

### Chemicals

Indomethacin and Sucralfate were obtained as gift samples from Micro labs (Mumbai, India).

### Plant materials

The stem bark of the *Ficus bengalensis* was collected locally from Dehradun, Uttarakhand, India. The plant material was taxonomically identified by the department of Botany, Quamau University, India.

### Preparation of methanol extract

The stem bark was shade, dried and pulverized. The powder was treated with petroleum ether for dewaxing and removing chlorophyll. Later, it was placed in glass container and macerate with methanol for about 7 days. After maceration the solvent was distilled off and the extract was concentrated under reduced pressure on a water bath at a temperature below 50°C to a syrupy consistency. Then it was dried in the dessicator.

**Animals**

In the present study Adult albino rats (150-200g) of either sex were used. All the animals were procured from the disease-free animal house of CCS Haryana Agriculture University, Hisar, India. The animals had free access to food and drinking water as per CPCSEA dietary norms. They were subjected to natural light-dark cycle (12 hours each). The animals were acclimatized for at least 5 days to the laboratory conditions prior to experimentation. Experiments pertaining to this research work were carried out between 0900-1800h. The experimental protocol was approved by the Institutional Animal Ethics Committee wide its letter No-LSCP/2010/576 dated 06-09-2011. The care of the animals was taken as per the guidelines of CPCSEA, Ministry of Forests & Environment, and Government of India.

**Acute oral toxicity study and selection of doses**

A safe oral dose of extract was determined through the acute oral toxic test in rats as described by the Organization of Economic Co-Operation and Development (OECD) as per 423 guidelines[12]. The stem bark extract, at different doses up to 2000 mg/kg, was prepared by dissolving the extract in distilled water and the concentration was adjusted in such a way that it did not exceed 1 ml/100g of the rat. The extract was then administered and animals were observed for behavioral changes, any toxicity and mortality up to 48 h. Three different doses (100, 200 and 400 mg/kg) of the stem bark extract were later chosen for this study based on the acute toxicity testing.

**Anti-ulcer assays**

**Ethanol-acid-induced gastric ulcers**

Thirty six over-nights fasted rats were divided into six groups of six rats each. All the groups of rats were given treatments as follows: Group I: Normal control group receives vehicle only, Group II: Negative control group receives 5ml/kg ethanol-acid solution + Vehicle, Group III: receives 5ml/kg ethanol-acid solution + 100mg/kg Sucralfate, Group IV: receives 5ml/kg ethanol-acid solution + 100mg/kg methanolic stem bark extract of *Ficus bengalensis*, Group V: receives 5ml/kg ethanol-acid solution + 200mg/kg methanolic stem bark extract of *Ficus bengalensis*. Group VI: receives 5ml/kg ethanol-acid solution + 400mg/kg methanolic stem bark

extract of *Ficus bengalensis*. Thirty minutes later, ulcers were induced by administering 1ml ethanol-acid (5% acid) to each rat. All administrations were by oral route. One hour later all the rats were sacrificed and the stomach were excised, cut along the greater curvature and gently rinsed under tap water and finally the Ulcer index was determined.

**Indomethacin-induced gastric ulcers**

The gastric ulcers were induced by administering Indomethacin (5mg/kg) for five days. The animals were then treated either with misoprostol (100 mg/kg) or the methanolic extract of *Ficus bengalensis* (100, 200 and 400mg/kg) once daily for another five days, after the induction of ulcer. The control group received only vehicle (Distilled water). The rats were sacrificed on the fifth day after the test solutions administration and the Ulcer index was determined. The animals were divided into six groups each group containing six rats and treated with respective test solutions as given below:

Group I: Normal control group- Vehicle+ Vehicle

Group II: Negative control group- 5mg/kg Indomethacin+ Vehicle

Group III: 5mg/kg Indomethacin+ 100mg/kg misoprostol

Group IV: 5mg/kg Indomethacin+ 100mg/kg methanolic stem bark extract of *Ficus bengalensis*

Group V: 5mg/kg Indomethacin+ 200mg/kg methanolic stem bark extract of *Ficus bengalensis*

Group VI: 5mg/kg Indomethacin+ 400mg/kg methanolic stem bark extract of *Ficus bengalensis*

**Ulceration index**

One hour after absolute ethanol-acid and Indomethacin challenge to the animals, they were sacrificed by cervical dislocation. Their livers were removed for subsequent biochemical assays. Their stomachs were also removed and opened along the greater curvature and their lesions were examined and scored ($mm^2$) macroscopically, using a hand lens[13]. The gastric mucosa was scrapped with glass slides and stored at $4^oC$ for subsequent biochemical assays. Ulcer index (UI) was calculated thus:

$$UI = \frac{\text{Total ulcer score}}{\text{Number of animals ulcerated}}$$

**Statistical analysis**

Data is expressed as mean ± SEM. Data was analyzed by one way ANOVA followed by Dunnett's multiple comparison tests. The significance of difference was accepted at $P< 0.01$.

## RESULTS AND DISCUSSION

Methanol extract of stem bark up to 2000mg/kg did not cause any mortality in mice. None of the doses tested produced any gross apparent effect on general moto activity, muscular weakness,

fecal output, feeding behavior etc. during the period of observation. The etiology of ulcer is not clear. The pathogenesis of ulcer remains controversial but its cause is known to be aggravated by an imbalance between the aggressive factors (i.e. acid and pepsin) and factors that maintain mucosal integrity (i.e. mucus, bicarbonate and prostagladins) [14]. The use of Sucralfate in this study was due to its increasing prescription in ulcer patients in this country and specifically due to its non anti-secretory but mucoprotective nature[15]. It is known to act by several mechanisms which include physical protection of stomach, synthesis of prostaglandins and stimulate mucus and bicarbonate secretion[16]. It has been documented to be effective in uncomplicated NSAID induced ulcers[17, 18, 19] but it does not cure ulcers. Ethanol has been shown to increase the risk of ulcer in humans but produces potent ulceration in rats[20]. It is believed to produce reactive species responsible for mucosal injury[21] and lipid per-oxidation, a free radical mediated process that ultimately destroys lipids membrane[22]. Administration of *Ficus bengalensis* methanol stem bark resulted in significant reduction in ulcer index in dose dependent manner with compared to control (Table 1). In case of Indomethacin-induced ulcers, extract also showed significant reduction of ulcers in a dose dependent manner (Table 2).

**Table 1: Effect of methanolic extract of *Ficus bengalensis* stem bark on ulcer index on Ethanol-acid induced gastric ulcer**

| Group | Treatment | Dose (mg/kg) | Ethanol-acid induced gastric ulcer |
|---|---|---|---|
| I | Control | --- | 11.06 |
| II | Sucralfate | 100 | 4.67* |
| III | *Ficus* extract | 100 | 7.85 |
| IV | *Ficus* extract | 200 | 5.42* |
| V | *Ficus* extract | 400 | 3.86** |

[1]Each value represents the mean (Standard deviation for each of the test solution was less than 10% of the mean value), where *represents significant at P<0.05, **represents highly significant at P<0.01, The standard drug used was 100mg/kg Sucralfate,

**Table 2: Effect of methanolic extract of *Ficus bengalensis* stem bark on ulcer index on Indomethacin-induced gastric ulcer**

| Group | Treatment | Dose (mg/kg) | Indomethacin - induced gastric ulcer |
|---|---|---|---|
| I | Control | - | 10.65 |
| II | Misoprostol | **100** | 5.34* |
| III | *Ficus* extract | **100** | 8.94* |
| IV | *Ficus* extract | **200** | 7.08* |
| V | *Ficus* extract | **400** | 4.72* |

[1]Each value represents the mean (Standard deviation for each of the test solution was less than 10% of the mean value), where *represents significant at P<0.05, **represents highly significant at P<0.01, The standard drug used was 100mg/kg misoprostol.

## CONCLUSION

In conclusion, our results suggest that *Ficus bengalensis* methanolic extract are gastro-protective against acute ethanol-acid and Indomethacin induced ulcer models. So, we suggest that natural gastro-protective agent in *Ficus bengalensis* may be effective as plant gastro-protector and thus may have some obvious therapeutic implications.

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