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**Annals of Biological Research, 2010, 1 (4) : 234-239**
***(http://scholarsresearchlibrary.com/archive.html)***

Annals of Biological Research
Scholars Research Library
**ISSN 0976-1233**
**CODEN (USA): ABRNBW**

# Antiulcer activity of ethanolic extract of *Buchanania lanzan* Spreg. roots

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## ABSTRACT

*Buchanania lanzan Spreng. plant is well known for its medicinal and therapeutic values in Indian folk medicine. However, to be clinically useful, more scientific rationale are essential. Therefore, in the present study, we investigated the effects of ethanolic extract of Buchanania lanzan Spreng roots (EBL) for its antiulcer activity. To assess the antiulcer activity of varied concentrations of the EBL (200 and 400 mg/kg orally) was evaluated for ethanol induced ulcer in mice and pylorus ligation induced ulcer in rats. EBL showed a dose-dependent protection against gross damaging action of ethanol and Pylorus ligation on gastric mucosa of animals. The treatment with EBL shown significant protection of ulcer index in both the models as well as also inhibited the pylorus ligation-accumulated gastric secretion. Thus, our present study results clearly demonstrate that EBL is in possession of good preventive and therapeutic action on the gastric ulcers.*

**Keywords:** Buchanania lanzan Spreng., Ulcer, Pylorus ligation

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## INTRODUCTION

Peptic ulcer disease is a serious gastrointestinal disorder that requires a well targeted therapeutic strategy. A number of drugs including proton pump inhibitors and $H_2$ receptor antagonists are available for the treatment of peptic ulcer, but clinical evaluation of these drugs has shown incidence of relapses, side effects, and drug interactions. 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. Drugs of plant origin are gaining popularity and are being investigated for a number of disorders, including peptic ulcer. Indian Medicinal plants and their derivatives have been an invaluable source of therapeutic agents to treat various disorders including peptic ulcer. An indigenous drug possessing fewer side effects is the major thrust area of the present day research, aiming for a management of peptic ulcer [1].

*Buchanania lanzan* Spreng. (family: Anacardiaceae) commonly known as Char in hindi is a subdeciduous tree, 13-17m high and upto 1.3m in girth, dark grey bark, Leaves alternate, petiolate, very coriaceous or hard sessile greenish white flowers and stone hard bi- valved kernel has a pleasant sweetish acidic flavor; found throughout the hot dried parts of India (2).Tribal people of Jharkhand and Chhattisgarh are using *Buchanania lanzan* Spreng. mainly for wound healing, anti-diarrhoeal, analgesic and antiulcer activity but no scientific study has been carried out regarding its pharmacological activities. Therefore present study designed to evaluate the antiulcer activity of *Buchanania lanzan* Spreng.

## MATERIALS AND METHODS

### *Plant material identification and extraction*

*Buchanania lanzan* Spreng roots were collected in September 2008 from B.I.T. Mesra, Ranchi India. Further taxonomic identification was done Dr. S. Jha, Associate Professor, Dept. of Pharmacognosy, BIT, Mesra, Ranchi. The roots were dried in shade for 15 days and to ensure complete dryness plant roots were kept in hot air oven at 45˚C for 10 minutes. Then roots were subjected to size reduction to make coarse powder and passed through 40-mesh sieve and stored in an airtight container for further use. The dried and powdered roots were subjected to hot extraction in Soxhlet apparatus with ethanol.

### *Animals*

Swiss albino mice weighing 25–30gm and Wister albino rats weighing 180-200 gm of either sex were used in the study. Animals were procured from Laboratory Animal House of Birla Institute of Technology, Mesra (Reg. no.: 621/02/ac/CPCSEA). All animal experiments strictly complied with the approval of institutional animal ethical committee. The animals were kept in polyacrylic cages and maintained under standard housing conditions of temperature (24-27°C) and humidity (60-65%) with 12:12 light:dark cycles. They were acclimatized for seven days. Food was provided in the form of dry pellets and water *ad libitum.*

### *Acute toxicity assay*

Acute toxicity assay was performed in mice according to OECD guidelines. Animals were divided into different groups of six each. After an overnight fast, the test drug was administered orally in graded dose (100–2000 mg/kg). In further, they were observed continuously for the first 2 h for toxic symptoms and up to 24 h for mortality. There was no lethality in any of the groups after treatment [3].

### Experimental Procedures

### Ethanol-induced ulcer model

Swiss albino mice of either sex were divided into five groups, each group consists of six animals. All groups of animals received following treatments for 5 days: groups 1 **(Normal)** and 2 **(Control)** received vehicle 10 ml/kg, groups 3 and 4 **(Test)** were given EBL 200 and 400 mg/kg, respectively, and the group 5 **(Standard)** given reference drug **Sucralfate** at the dose of 100 mg/kg. On the 5$^{th}$ day, 1h after final dose of treatment, the gastric ulcers were induced in rats by administering **96% ethanol** (5ml/kg). After 1h animals were sacrificed by cervical dislocation and stomach was incised along the greater curvature and examined for ulcers index [4]. Percentage ulcer inhibition was calculated for each group on comparison with vehicle control group.

**Pylorus ligation model**

Wister albino rats of either sex were divided into five groups, each group consists of six animals. All groups of animals received following treatments for 5 days: groups 1 **(Normal)** and 2 **(Control)** received vehicle 10 ml/kg, groups 3 and 4 **(Test)** were given EBL 200 and 400 mg/kg, respectively, and the group 5 **(Standard)** given reference drug **ranitidine** (RAN) at the dose of 100 mg/kg. All the doses calculated with respective body weights of animals and administered orally. Ulceration in rats was induced by method of Shay et al, 1945. On 5$^{th}$ day pylorus part was ligated following 36 h fasting. After the pretreatment period of 1h animals were anaesthetized using pentobarbitone (35 mg/kg, i.p.), the abdomen was opened and pylorus ligation was done without causing any damage to its blood supply. The stomach was replaced carefully and the abdomen wall was closed in two layers with interrupted sutures. After 4 h of pylorus ligation, stomachs were dissected out and cut open along the greater curvature and examined for ulcers index [5]. The gastric juice was titrated against 0.01N sodium hydroxide using Topfer's reagent as indicator to find out the free acidity and total acidity [6].

**Calculation of ulcer index and Percentage ulcer inhibition**

Ulcer index has been calculated by adding the total number of ulcers per stomach and the total severity of ulcers per stomach [7]. A score for the ulcer was made as follows:

• 0: normal colored stomach.
• 0.5: red coloration.
• 1: spot ulcers.
• 1.5: haemorrhagic streak.
• 2: ulcers.
• 3: perforation.

**Mean ulcer score for each animal was expressed as ulcer index**. The percentage of ulcer inhibition was determined as follows:

$$\textbf{\% inhibition of Ulcer Index} = \frac{[\textbf{Control mean ulcer index} - \textbf{Test mean ulcer index}]}{[\textbf{Control mean ulcer index}]} \times 100$$

**Statistical Calculations**

The data expressed are mean ± standard error of mean (SEM). All statistical comparisons between the groups are made by means of One Way Analysis of Variance (ANOVA) with post hoc Dunnett's test or by Student's t-test using Graphpad Prism 5 software. The p value less than 0.01 is regarded as significant

## RESULTS

EBL was found to non-toxic as it did not show any toxic symptoms and mortality up to the dose of 2000mg/kg. Effects of EBL at dose of 200 and 400 mg/kg body weight, twice a day for 5 days prevented the acute gastric ulcers in a dose related manner. Administration of EBL 1 h before the induction of gastric lesions by ethanol showed significant activity, and inhibited the total ulcer index by 65.8±3.1 to 72.6±2.8 percent in dose dependent manner (Fig. 1). Results for EBL are comparable to RAN at the dose of 100 mg/kg.

**Table 1: Effect of alcoholic extract of *Buchanania lanzan* spreg. roots on gastric secretion, acidity and pH in plus pylorus ligated rats**

| Treatment | Normal | Control | EBL 200mg/kg | EBL 400mg/kg | Standard 100mg/kg |
|---|---|---|---|---|---|
| **Volume of gastric secretion (ml/100 g)** | 1.28±0.02 | 2.37±0.06[a] | 1.52±0.04[b, c] | 1.43±0.03[c] | 1.36±0.02[c] |
| **Free acidity (mequiv./l/100 g)** | 114±4.23 | 220±6.21[a] | 137.8±5.12[c] | 128.3±3.60[c] | 118.4±4.90[c] |
| **Total acidity (mequiv./l/100 g)** | 255±8.20 | 510±10.50[a] | 380±7.90[a, c] | 342±7.35[a, c] | 354±8.64[a, c] |
| **pH** | 3.20±0.04 | 2.0±0.12[a] | 2.95±0.07[c] | 3.00±0.06[c] | 3.20±0.10[c] |

Values are expressed in mean ± SEM (n=6)
[a] *p<0.001 compared with normal group;* [b] *p<0.01 compared with normal group;*
[c] *p<0.001 compared with control group;* [d] *p<0.01 compared with control group*

The oral administration of EBL at 200-400 mg/kg in pylorus ligature inhibited the total ulcer index by 60.4±2.9 to 69.5±3.7 percent in dose dependent manner as compare to control (Fig. 1). In pylorus ligation induced gastric ulcer the EBL showed significant reduction in gastric volume, free acidity, total acidity and ulcer score (Table 1).

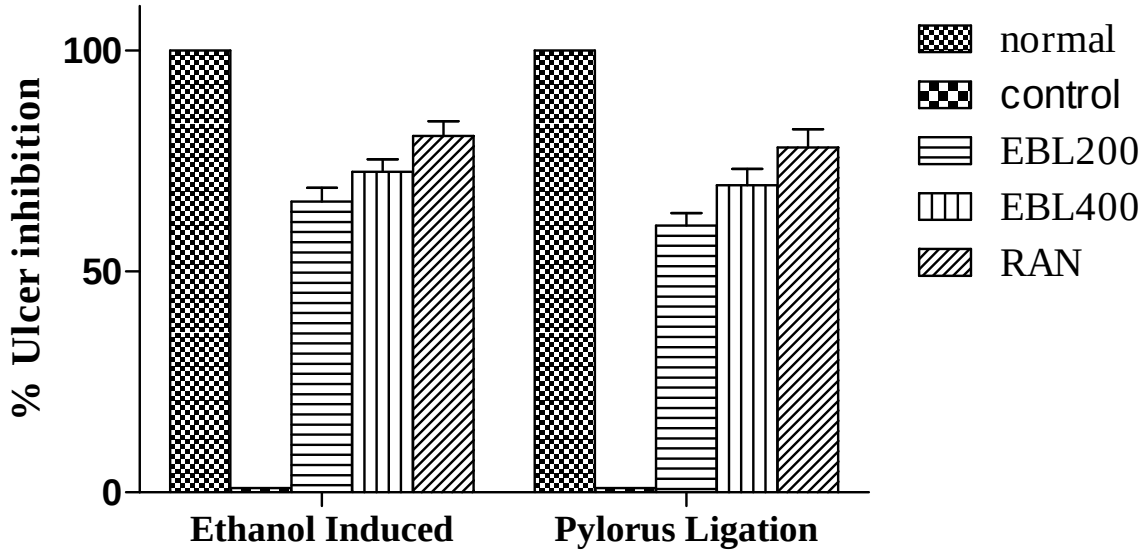


**Figure 1: Ulcer Inhibition by alcoholic extract of *Buchanania lanzan* spreg. roots**

## DISCUSSION

Peptic ulcer is a common disease of modern life style due to changed food habits and ever increasing stress. The imbalance of aggressive (gastric juice, pepsin) and protective factors include mucosal blood flow, bicarbonate secretion, the secretion of mucosa integrality of cellular membrane, cell regeneration, prostaglandin and other hormones, are considered as the major mechanism. The allopathic drugs of ulcer inhibit the acid secretion, protect the mucosa, and inhibit the Helicobacter pylori [8]. We designed two different experimental models Ethanol-induced gastric ulcer and Pylorus ligation induced gastric ulcer to investigate the effect and mechanism of EBL on gastric ulcer. Ulcer index parameter was used for the evaluation of anti-ulcer activity since ulcer formation is directly related to factors such as reduction in gastric volume, decrease in free and total acidity.

Alcohol can cause the lesion of gastric mucosa, reinforcement of the aggressive factors while weakness of the protective factors, so the ulcer was formed. Studies suggest that the ethanol damage to the gastrointestinal mucosa starts with microvascular injury, namely disruption of the vascular permeability, edema formation and epithelial lifting [9]. Ethanol induced gastric damage in mice possibly through leukotrienes production and also involvement of 5-lipooxygenase in the formation of ulcer lesion. Prostaglandins also play a role in ethanol-induced ulcer. So the protective effect of the EBL against the gastric damage might be due to protection against 5-lipooxygenase or leukotriene pathway. The cytoprotective action possibly stimulates the prostaglandin synthesis, which in turn is involved in cytoprotection of the gastric mucosa. It is well known that ethanol induced gastric lesions are not inhibited by antisecretory agents like ranitidine but are inhibited by agents which enhance mucosal defense factors such as sucralfate. The gastroprotective effect in ethanol model indicates that the EBL could enhance cytoprotective mechanism of the gastric mucosa [10].

Pylorus ligation can lead to the accumulation of gastric juice in the stomach, damaging the balance of aggressive and create protective factors, therefore, ulcer is shaped. On Pylorus ligation-accumulated secretions and the related ulcers confirm gastric acid output to be the root cause of gastric ulcers [11]. EBL attenuated the gastric volume, free acidity, total acidity and ulcer index thus showing the antisecretory mechanism. Ranitidine is standard control used here to test antisecretory mechanism.

Our present study results clearly demonstrate that EBL is in possession of good preventive and therapeutic action on the gastric ulcers. It was a dose-dependent protection against gross damaging action of ethanol and Pylorus ligation on gastric mucosa of animals.

## CONCLUSION

Present study indicates that ethanolic extract of *Buchanania lanzan* spreg. roots have good anti-ulcer activity.

**Acknwoledgement**
We are thankful to Department of Pharmaceutical Sciences, BIT Mesra for providing the necessary facilities for our research work.

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