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Evaluation of anti-ulcer activity of ethanol extract of ficus Arnottiana (Miq.) barks in albino rats

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Research Article

Abstract

Background and objectives:

Ulcer is a GI disorder resulting due to mucosa membrane breach of the alimentary tract, which passes through the muscularis mucosa into the sub-mucosa to cause deeper peptic ulcer disease. It occurs due to imbalance between the aggressive and the defensive factors. Ficus arnottiana (Miq.) (Moraceae) is one of the medicinal plants which have anti ulcer property. Hence evaluate the anti ulcer activity of ethanol extract of ficus Arnottiana (Miq.) barks in albino rats.

Materials and Methods:

The barks of Ficus Arnottiana (Miq.) were air dried and powdered. The plant materials are extracted by maceration with ethanol for 72 hrs. The extracts are concentrated using rotary vacuum to get solid mass. The study was carried out by using pylorus ligation in-vivo screening method in albino rats. The animals are divided into 4 groups namely control group, standard group, low dose and high dose of EEFA treated group. The parameters are evaluated such as ulcer index, % protection and gastric volume, pH of gastric juices, total acidity.

Result:

The different doses of EEFA treated group have shown a significant decrease in ulcer index, gastric volume, pH, etc. when compared to the other groups.

Conclusion:

From this study, it is clear that Ficus Arnottiana (Miq.) bark extract have significant anti ulcer activity in animal models. The extract is non-toxic even at relatively high concentrations. The anti ulcer activity is probably due to the presence of sterols.

Keywords: *Ficus arnottiana (Miq.), Moraceae, Ethanol, Pylorus ligation, ulcer index, sterols*

Introduction:

Ulcer is a gastrointestinal disorder resulting due to an imbalance between the aggressive and the defensive factors. These aggressive factors include physical stress, prominent tobacco consumption, alcohol or caffeine, certain types of medication, particularly the non-steroidal anti-inflammatory drugs and infection by *Helicobactor pylori*.[1] Peptic ulcers are chronic and often single lesions that may occur in any part of the digestive tract. Further, herbal drugs mostly augment the defensive factors such as mucin secretion, cellular mucus, bicarbonate secretion, mucosal blood flow and cell turnover.[2&3]

In duodenal ulcer acid secretion is high in half of the patients but normal in the rest.[4] Functional polymorphisms in different cytokine gene are associated with peptic ulcers. For example, polymorphisms of interleukin-1 β affect mucosal interleukin-1 β production, causing H. pylori associated gastro-duodenal disease. A meta- analysis of observational studies resulted in a conclusion that non-steroidal anti-inflammatory drugs, aspirin use and *H. pylori* infection increases the risk of peptic ulcer disease independently.[5]

Ficus arnottiana (Miq.) (Moraceae) is one of the medicinal plants which have antiulcer property. It is an important traditional medicinal plant widely distributed throughout India, mostly habitat in Rocky hills. It has several vernacular names such as paras pipal, pimpli, payar, kallal, plavanga, kaduaswatha, etc. *Ficus arnottiana (Miq.) (Miq.)* contains various chemical constituents like β Sitosterol, Gluanol Acetate And Glucose, Friedelin, Sterols, Alkaloids, Carbohydrates, Tannins, Phenols & many other biologically active compounds.

The ethanolic extract of barks of *Ficus arnottiana (Miq.) contains* β sitosterol which is more responsible for treatment of peptic ulcer.

Materials and Methods:

Animals:

Wistar albino rats of both sex and Swiss albino mice were obtained from Mahaveera Enterprises, D.No.2-2-647/258, Srinivas Nager Colony, Bagh Amberpet, Hyderabad-500013. The animals were housed in polypropylene cages at 24±2°C and fed with commercial pellet diet and water *ad libitum*. All animal experiments are carried out in accordance with the guidelines of CPCSEA and the study was approved by the Institutional Animal Ethics Committee, Ref. no. HKES'S/MTRIPS/IAEC/124/2021-2022 HKE'S MTRIPS, Gulbarga.

Plant material:

The bark of *Ficus Arnottiana (Miq.)* are collected from GIMS & PWD Bhavan, Kalaburagi area during September 2021 and authenticated by Principal N. G. Patil, Department of Botany, Smt. V. G. Womens Degree College, Kalaburagi-585102. The bark of *Ficus Arnottiana (Miq.)* are air-dried and powdered, the plant materials were extracted by maceration process with ethanol for 72h. The extract are concentrated using rotary vacuum to get the solid mass.

Acute oral toxicity study:

A safe oral dose of the extracts are determined by acute oral toxic class method of Organization of Economic Co-Operation and Development (OECD) as per 423 guidelines. Four groups (n = 6) of either sex wistar albino rats are used in the acute toxicity study of *Ficus arnottiana (Miq.)* ethanolic extract. Animals from all groups are fasted overnight and administered (p.o.) with single dose (250, 500, 2000 and 5000 mg/kg) of the extract. A group of animals which received equal volume of Sodium Carboxy Methyl Cellulose served as control. Changes in the behavior of animals are observed for 24hrs after extract administration. For any signs and mortality, animals were observed for 14 days.[4]

Pylorus ligation induced gastric ulcer in rats:

The wistar albino rats weighing 100-200g of either sex are divided into 4 groups, each group consists of 6 animals. Group I: served as control received 1.0 ml/kg p.o 1% Sodium Carboxy Methyl Cellulose (NaCMC), Group II: treated with ranitidine as standard (50 mg/kg, p.o.), Group III: treated with EEFA (250 mg/kg, p.o.) and Group IV: treated with EEFA (500 mg/kg, p.o.). Pylorus part were ligated following 36 hrs fasting, 19 hours after the pyloric ligation the animals are sacrificed by decapitation. The stomach is opened and the ulcer index, % protection, gastric volume, pH of gastric juices is determined. The gastric content are titrated against 0.01N NaOH to find out the free acidity and total acidity.

Results:

Acute oral toxicity study:

Single dose (250, 500, 2000 and 5000 mg/kg) ethanolic extract of barks of *Ficus Arnottiana (Miq.)* administered to albino rats showed no death up to 14 days study period. Even at the highest dose (5000 mg/kg), there were no physical signs of toxicity as evidenced by normal breathing and the absence of tremors, convulsions, diarrhoea, salivation and paralysis in the treated animals. But CNS depression, skin irritation, sedation were noticed up to 3hrs after administration of 5000mg/kg extract Observation of animals over the next 14 days showed no adverse effect of treatment.

Pylorus Ligation Method:

A significant ($P<0.01$) increase in the ulcer index is observed in the pylorus ligated group when compared to the control group shown in figure no.01. EEFA 250mg/kg and 500mg/kg treated group have shown a significant ($P<0.01$) decrease in the ulcer index and ranitidine 50mg/kg p.o. treated group have shown a significant ($P<0.01$) decrease in the ulcer index when compared to the pylorus ligated group. EEFA has shown increased pH and decreased total acidity of gastric fluid shown in table no.01. Thus, the possible mechanism of gastric mucosal protection by EEFA may be partly due to the reinforcement of resistance of the mucosal barrier by a protective coating.

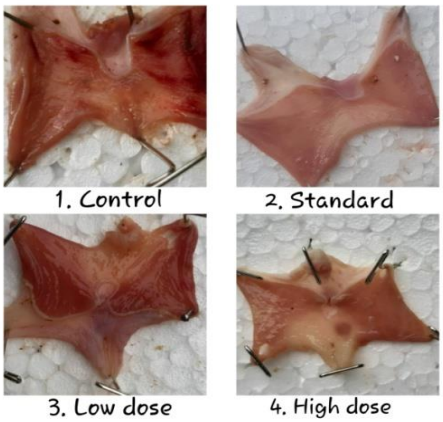

Figure no. 01

Table no. 01: The effect of EEFA on ulcer index, total acidity, pH, gastric volume, % protection in pylorus ligation model.

Group	Dose	Ulcer Index	Total Acidity	pH	Gastric volume	% Protection
Control	Na CMC	0.845 ± 0.6150 ns	0.827 ± 0.6797 ns	1.983 ± 0.2723 ns	3.58 ± 0.6797 ns	-
Standard	20 mg/kg	4.683 ± 0.6150 ***	4.943 ± 0.6797 ***	5.435 ± 0.2723 ***	6.46 ± 0.6797 ***	90.1% ***
Low dose	250 mg/kg	2.797 ± 0.6150 *	3.148 ± 0.6797 *	2.938 ± 0.2723 *	5.31 ± 0.6797 *	68.3% *
High dose	500 mg/kg	3.772 ± 0.6150 **	3.913 ± 0.6797 **	3.599 ± 0.2723 **	5.90 ± 0.6797 **	79.8% **

All the values are mean ± SEM n = 5 ***P< 0.001, **P<0.01, compare vs control, data was analyzed by using one way ANOVA followed by Tukey multiple comparison test.

Discussion:

Peptic ulcers and gastritis are due to imbalance between offensive (e.g. NSAIDs, alcohol, acid and pepsin) and defensive (e.g. mucus, bicarbonate, mucosal blood supply) factors. Pepsin and acid are relatively less important causative agents, but defects in the defensive mechanism of gastric mucosa are the first step towards ulcer formation. Generally, various non-specific methods are used to restore these imbalances including regular food intake, adequate rest and avoidance of ulcerogenic agents (e.g. tobacco, alcohol and coffee). Their aims are to satisfy and possibly block the gastric acid secretion or to enhance the mucosal defense mechanisms.[1]

Pylorus-ligation induced gastric ulcer occurs because of an increase in acid-pepsin accumulation due to pyloric obstruction and subsequent mucosal digestion. The activation of vagus-vagal reflux by stimulation of pressure receptors in the antral gastric mucosa in the hyper secretion model of pylorus ligature is believed to augment gastric acid secretion.

Conclusion:

From this study, it is clear that *Ficus arnottiana (Miq.)* bark extract have significant antiulcer activity is probably due to the presence of sterols in animal models. The extract is non-toxic even at relatively high concentrations.

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